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THE COLOR COMPUTER MONTHLY MAGAZINE

March 1991 Vol. X No.8

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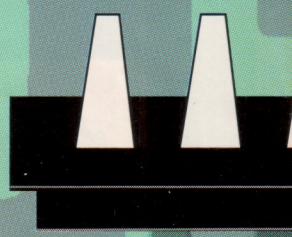

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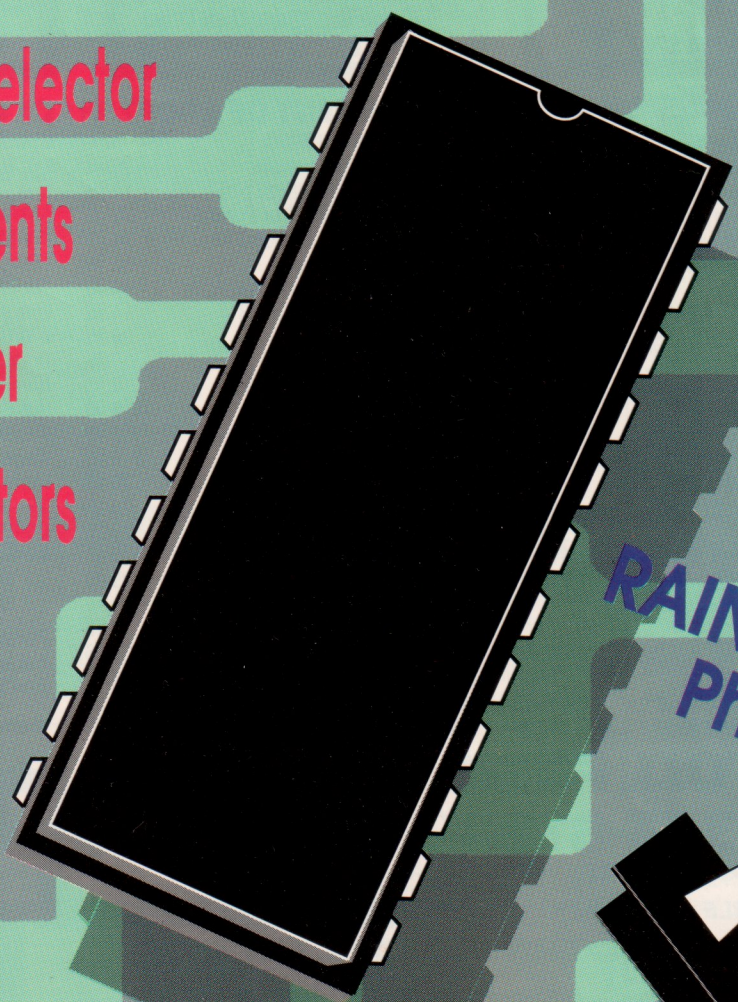

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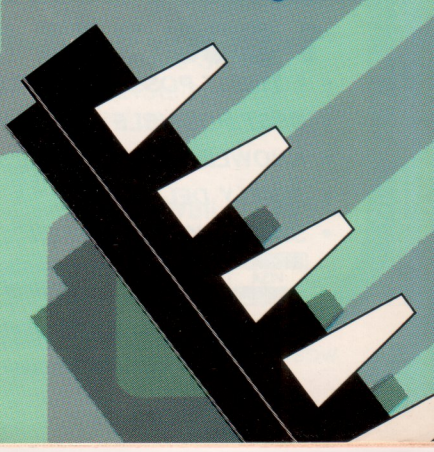

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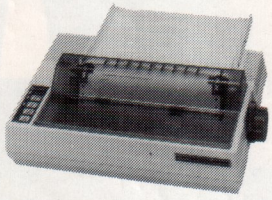

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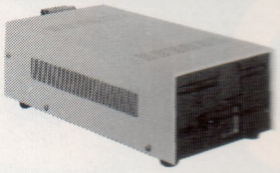

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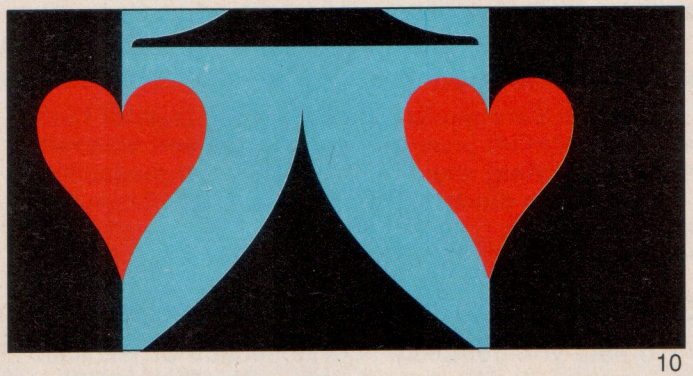
Table of Contents

March 1991
Vol. X No. 8

Features



10

10
Blackjack
James Ritchie Carroll
Play a winning hand with your CoCo

14
A Monitor for the CoCo 3
Marty Goodman
Something old, something new; from monochrome to red-green-blue

16
CoCo Data Logger
Ken Boone
An eventful program for monitoring the real world

28
Sort
Stephen B. Goldberg
Getting it all straight with OS-9

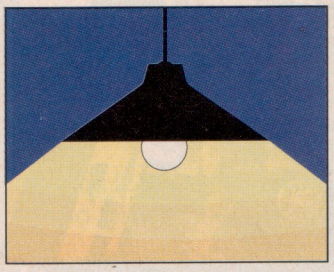
34
Disk Controller ROM selector
Robert C. Merryman
From one ROM to another

44
Soldering Fundamentals
Charles F. Phillips
Learning to be a solder of fortune

48
Pictures from RAINBOWfest
Staff
Photos from the Chicago 1990 show

51
The Assembly Line
William P. Nee
Warp speed ahead

16



Product Reviews

Brainbuster Examiner/*The Trading Post* ____ 64
Brainbuster Testwriter/*The Trading Post* ____ 68
CoCo Archiver/*Danosoft* ____ 66
File Recovery System/*Burke & Burke* ____ 68
Graphics Utility/*Danosoft* ____ 67
Minigolf/*J.T. Rawlinson Software* ____ 64
Superbook/*Supersoft* ____ 70

Departments

Advertisers Index ____ 82
Back Issue Info ____ 80
Corrections ____ 67
Letters to Rainbow ____ 6
Received & Certified ____ 71
Reviewer Info ____ 63
Subscription Info ____ 56

The cassette tape/disk symbols beside features and columns indicate that the program listings with those articles are on this month's RAINBOW ON TAPE and RAINBOW ON DISK. Those with only the disk symbol are not available on RAINBOW ON TAPE. For details, check the RAINBOW ON TAPE and RAINBOW ON DISK ad on page 79r.

Novices Niche

9
Credits
James McCarthy

42
Ohm's Law
Loy Milam

57
Craps
Douglas Fingliss

78
Graphics Experiments
Keiran Kenny

Columns

72
BreakPoint
Greg Law
The auto formatter

38
CoCo Consultations
Marty Goodman
Sound advice

61
Delphi Bureau
Eddie Kuns
The mad slasher

8
Print#-2
Lonnie Falk
Editor's notes

31
Turn of the Screw
Tony DiStefano
How cold is it?

20
Wishing Well
Fred Scerbo
Visualizing fractions 4

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Letters to the RAINBOW

Hamming it Up

Editor:

In the December issue of THE RAINBOW, you printed a letter from Dean Maluski requesting information on amateur radio software for the Color Computer. In your response, you offered my name and address as a source. This letter has generated about two dozen responses thus far, including one from Mr. Maluski.

Unfortunately, I have been negligent in keeping THE RAINBOW updated as to my recent change of address. My new address appears below. I still have a forwarding order at my old address, so all of the responses have reached me with only a slight delay.

Also, in case you are unaware, there has been a major announcement regarding a "no-code" amateur radio license. Just a few days ago, the FCC issued a ruling that the Technician class license no longer requires a 5-word-per-minute Morse code test. The ruling takes effect in February 1991. Those prospective hams who opt to take the written test are limited to operation in the ham bands from 50 MHz and up. (VHF, UHF and Microwave). This is prime territory for packet operation.

This development may be of considerable interest to your readers. However, you may want to obtain independent confirmation from the American Radio Relay League (telephone: 203-666-1541), or directly from the FCC. I picked up the news on the amateur radio packet network. If this comes into being as described, it could be a major boon to computer hobbyists who also want to become hams.

Steve Ford
9 Grieb Court
Wallingford, CT 06492

A Vote for Better Docs

Editor:

First of all, let me say thank you to all of you at Falsoft. I have been receiving THE RAINBOW for about six months and wonder why I didn't subscribe sooner. I appreciate this fine publication!

I noticed a number of readers are having the same problems my wife and I had with *Home Publisher* from Radio Shack. We went to the Radio Shack computer center in Augusta, Georgia, and paid their systems engineer over $75 to show us how to get the program up and running. Even their computer expert could not get the program to perform properly and said himself it was a bad program with very poor documentation. We have not yet learned to use OS-9 Level II, but thought *Home Publisher* might run properly nonetheless. Has anyone tried it? If so, what were the results?

Finally, why is it that those who write programs for the CoCo assume that all of us are programmers as well? Some of the documentation is so complicated we just put the program aside and hope that, as time permits and we slowly learn how things work, we can eventually use it. So folks, have mercy on us poor novices and keep it simple, clear and logical.

Fred Wilson
556 Cherokee Drive
Waynesboro, GA 30830

Wants More from a Drive

Editor:

I have several things I should have said long ago but haven't until now. One is my concern about THE RAINBOW. I look forward to its arrival every month, but am disappointed in the decreasing size. I just received the January issue. It took only 20 minutes to read and digest all of the information from cover to cover. It used to take hours. I know this problem is out of your control, but it is a shame that such a great computer as the CoCo is losing so much support.

I would also like to know if you know where I could get a device driver for OS-9 to fully utilize my 1.44 Meg disk drive. I purchased it because it had 720K, but now that I know it can hold 1.44 Meg, I would like to use that.

Dennis Hennen
Route 2, Box 705
Tridelphia, WV 26059

We, too, would like to see stronger support for the CoCo. We don't like the size reductions any more than you.

While most 1.44-Meg drives can be used as 720K drives, a more sophisticated controller is required to use them to full capacity. A high-density drive requires a data transfer rate of 500K-bps, twice that of single- and double-density drives. For more information, read "Disk Drives and the Color Computer" (March and April 1990) by Marty Goodman.

In Praise of OS-9

Editor:

I want to voice my support for RAINBOW's decision to support OS-9, and urge an even greater dedication to it. It is, and will continue to be, the life-blood of this machine. Were it not for OS-9, I certainly would have left the CoCo Community for MS-DOS long ago. (I actually did buy a Tandy 3000, but came back to the CoCo when I discovered how much more powerful OS-9 is than MS-DOS.)

It surprises me how many people still use a CoCo 2 and/or have no interest in using OS-9. These people should find a friend who is running a 512K Color Computer 3 with OS-9 and *Multi-Vue* for a demonstration. Notice the Macintosh-type interface with the addition of color and multiple windows on multiple screens. OS-9 can be quite friendly. Take note of its abilities to protect files, set up user accounts/passwords, run programs concurrently, provide online help, use multiple fonts, set up a system clock/alarm, operate with a keyboard mouse, and to use a tree-like directory structure. The list goes on and on. Try it, you'll like it.

Tom A. Bauer
Los Angeles, California

Switch-Hitting Monitor

Editor:

I have just purchased an RGB CM-8 color monitor. I would like to know which computer keyboard it is compatible with other than the Color Computer 3 with 128K. If possible, I would also like to know if there are other keyboards outside of Tandy products that are compatible. Your assistance in this matter is greatly appreciated.

Andrea Mack
8715 First Avenue, #128-C
Silver Spring, MD 20910

The CM-8 is designed to work with the Color Computer 3. Short of major revisions, it cannot be

Continued on Page 74

COCO HARDWARE CATALOG

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Print#-2

Come One, Come All

Hardware and hardware people absolutely intrigue me. It is probably because I really do not understand hardware very well. And I suppose the fascination of RAINBOWfest is that there is probably more talk about hardware, and the opportunity to understand hardware, than just about anywhere else on Earth.

This year the CoCo Community gathers in Chicago for our 20th show on April 26-28. I am willing to bet that there is a lot of discussion of hardware then, probably more than at any time since the CoCo 3 was introduced. Why?

Well, first of all, I wager there are a couple of "CoCo 4s" at the show, actually ready for sale. This will, no doubt, inspire a great deal of discussion, including a lot of good information on the various ways to advantageously use whatever hardware you have.

RAINBOWfest is, as I say, a marvelous place to learn about this stuff. Sometimes, though, you can learn too much. Such was, as far as I was concerned, the case one evening at the RAINBOWfest in Long Beach, California. A few of us got together at a small reception on Saturday night and, as it seems to happen at RAINBOWfest, time just flew. Before I knew what had happened, the wives had gone to bed, the software dealers decided to rest their feet, and I was in the middle of an intense discussion on the merits of doing something with the Color Computer's chips that I neither understood nor could have implemented if I had.

This was a heavy-duty crowd, including some Radio Shack types, Marty Goodman and some others, who really knew what they were talking about. It was also heavy-duty time — about 3 a.m. in California, which is 6 a.m. where I came from (not enough days before for acclimation to the time).

There was a commotion in the hallway. Into the room popped three guys in tuxedos with red sashes across their chests. "Oh, oh," I thought. "Now what?"

They turned out to be refugees from a Knights of Columbus party in another room who had run out of ice. One of these fellows looked at my group seated around one table and asked if anyone had "any chips."

Was it a "local California dialect?" I don't know. But this guy was saying "chips" as in "ice" while, of course, the group thought they meant "chips" as in "computer."

Someone, probably Marty, asked if they needed RAM or a 6809 or something like that. The Knights looked confused. They mumbled something about wanting something cold. A "heat sink" was recommended.

The amazing thing was this conversation lasted for a good minute with the Knights talking about ice and the hardware guys intent on computer chips. The Knights finally left after finding some ice in a cooler in the room we were in.

Did I head for bed? Absolutely. Did Marty and his crew? Absolutely not.

All of this goes to say there is usually a lot going on at a RAINBOWfest, and not all of it in the formal exhibits, seminars or on the show floor. As usual, we expect a good and fun show in Chicago.

I hope you will join us.

— Lonnie Falk

Novices Niche

Credits

by James McCarthy

You have all seen credits at the end of movies. Credits are the names and titles you see scroll up the screen at the end of the movie. Credits are recognition for a job well done. Those involved with the creation of computer adventure programs should be no less recognized. With *Credits*, a new program for the CoCo, you can give credit where credit is due.

To operate the program, enter RUN"CREDITS". An introductory screen shows the program's functions and how to modify it for your own programs. For example, using a FOR/NEXT loop, I made the names of employees at THE RAINBOW scroll across the screen. It may not look like much by itself, but it really takes the unsuspecting person by surprise to see names scroll up the screen at the end of a program.

Credits was written on a CoCo 3 with Disk BASIC, but as far as I know, it works on any CoCo with 16K.

The Listing: CREDITS

```
1 'CREDITS
2 'WRITTEN BY JAMES ROBERT
3 'COPYRIGHT (C) MARCH 1991
4 'BY FALSOFT, INC.
5 'RAINBOW MAGAZINE
10 WIDTH32:CMP:CLS:PRINT@12,"CRE
DITS":PRINT@39,"BY JAMES MCCARTH
Y":PRINT:PRINT"'CREDITS' IS A SH
ORT PROGRAM    YOU CAN ADD TO TH
E END OF ONE OFYOUR OWN PROGRAMS
 TO SPICE UP   THE FINISH! AFTER
 WATCHING IT   AND SEEING WHAT I
T DOES, MODIFY"
11 PRINT"IT TO SUIT YOUR OWN NEE
DS. MAKE SURE YOU DON'T HAVE ANY
 LEFTOVERSPACE AT THE END OF YOU
R LINE.  FOR EXAMPLE, THIS IS HO
W YOUR   LINE SHOULD LOOK:
         PRINT@B,''THANKS TO MYS
ELF            '' : NOW, PRESS
ANY KEY"
12 EXEC44539
20 B=450:PALETTE13,0:PALETTE12,6
3:CLS:PRINT@458,"THE RAINBOW":FO
RA=1TO170:NEXT:PRINT@500,"":FORA
=1TO170:NEXT:PRINT@461,"STAFF":F
ORA=1TO170:NEXT:PRINT@500,"":FOR
A=1TO170:NEXT:PRINT@B,"EDITOR &
PUBLISHER-LONNIE FALK"
30 FORA=1TO170:NEXT:PRINT@B,"MAN
AGING EDITOR-CRAY AUGSBURG ":FOR
A=1TO170:NEXT:PRINT@B,"ASSOCIATE
 EDITOR—SUE FOMBY":FORA=1TO1
70:NEXT
40 PRINT@B,"COPY EDITOR———-
-ROB MOORE":FORA=1TO170:NEXT:PRI
NT@B,"SUB/REV EDITOR——TONY O
LIVE":FORA=1TO170:NEXT:PRINT@B,"
TECHNICAL EDITOR——GREG LAW":
FORA=1TO170:NEXT:PRINT@B,"TECH.
ASSISTANT——ED ELLERS"
50 FORA=1TO170:NEXT:PRINT@B,"TEC
H. ASSITANT-GREGORY SHULTZ":FOR
A=1TO170:NEXT:PRINT@B,"EDITR.ASS
IST.-JULIE HUTCHINSON":FORA=1TO1
70:NEXT:PRINT@500,"":FORA=1TO170
:NEXT:PRINT@500,"":FORA=1TO170:N
EXT:PRINT@B,"          THE RAINBO
W          ":FORA=1TO170
60 NEXT:PRINT@B,"    THE FALSOFT
 BUILDING      ":FORA=1TO170:NEX
T:PRINT@B,"          P.O. BOX 385
          ":FORA=1TO170:NEXT:PRIN
T@B,"      PROSPECT, KY 40059
   "
70 FORA=1TO170:NEXT:PRINT@500,""
:FORA=1TO170:NEXT:PRINT@500,"":F
ORA=1TO170:NEXT:PRINT@B,"THIS PR
OGRAM WAS WRITTEN BY    ":FORA=1T
O170:NEXT:PRINT@B,"JAMES MCCARTH
Y ON DECEMBER 2, ":FORA=1TO170:N
EXT:PRINT@B,"1990. NOW, MODIFY T
HIS FOR    ":FORA=1TO170
80 NEXT:PRINT@B,"YOUR OWN PROGRA
MS!            ":FORA=1TO170:NEX
T:FORA=1TO15:PRINT@500,"":FORB=1
TO170:NEXTB,A:CMP:CLS:END
```


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Play a winning hand with your CoCo

Blackjack

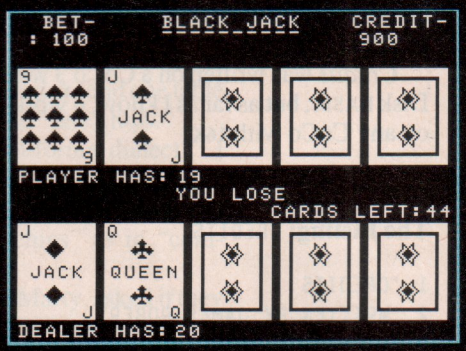
by James Ritchie Carroll

A game of *Blackjack*, anyone? Don't worry about shuffling or fumbling with the cards, just let the CoCo do all the work (and with great graphics and sound effects, too). For the unfortunate souls who have never played Blackjack, prepare yourself for the excitement of high-speed card playing and the loss of money (unless you're lucky). The object is to get as close to 21 as possible without going over. The winner is the one who is closest to 21 without going over.

To begin play, make your bet at the sound of the beep. You are then dealt two cards. From here you can either press H for Hit or S for Stand. *Hit* is to be dealt another card and *stand* is when you choose to receive no more cards. When you finally stand, assuming you haven't gone over 21, the computer plays its hand against yours. If you win, you collect from the computer. Blackjack, as well as drawing five cards without going over 21, pays double. If you lose, you pay. Ties are even with no money taken by either party.

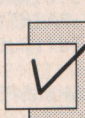
James Ritchie Carroll is 18 years old and a graduate of Laurel County High School in London, Kentucky. He is a self-taught programmer. He may be contacted at Route 2, Box 163, Athens, TN 37303, (615) 263-7776. Please include an SASE when requesting a reply.

The card values are determined by their numbers. However, the face cards have a value of 10. The only exception is the Ace, whose value is either 1 or 11 (your option). For those with a disk system, the high score is saved along with the lucky person's name.



After you enter the program (and with the first run through) if no other major bugs are detected, check the numbers and letters. If garbage appears after a word or number has been erased, some of the data has been entered incorrectly. If you can determine the fouled letter or number, print its ASCII equivalent, which corresponds to the line number at the beginning of the program where you can check for errors against the listing. Caution, the program uses a high-speed poke. Remember to poke back to normal speed before saving your corrections. Those with a CoCo 3 need not worry, your speed reduces automatically thanks to the `ON BRK GOTO` function.

See you next game! ❑



57	96	64Ø	237	1235	184
8Ø	187	71Ø	81	13ØØ	162
115	69	77Ø	37	138Ø	51
23Ø	2Ø5	845	182	1455	193
295	47	91Ø	156	151Ø	82
36Ø	1Ø2	98Ø	62	1565	13
415	141	1Ø45	165	16ØØ	84
485	64	111Ø	124	END	194
565	35	1155	74		

The Listing: BLAKJACK

```
1 'BLACK JACK
2 'WRITTEN BY RITCHIE CARROLL
3 'COPYRIGHT (C) MARCH 1991
4 'BY FALSOFT, INC.
5 'RAINBOW MAGAZINE
2Ø GOTO1Ø25
48 DATA XLE$(14);BUNE3BD
49 DATA BR2R2LU6DNLD5BL3
5Ø DATA NR4U2ER2EUHL2GBD5
51 DATA BUFR2EUHNLEUHL2GBD5
52 DATA BR3U6G3R4BD3BL4
53 DATA BUFR2EU2HL3U2R4BD6BL4
54 DATA BRR2EUHL3D2U4ER2BL3BD6
55 DATA UE4UL4BD6
56 DATA XN$(3);BUUENRHUBD5
57 DATA BRR2EU4D2L3HUER2BL3BD6
65 DATA U2R4D2U4H2G2D4
66 DATA RU6LR3FDGNL2FDGL3
67 DATA BUU4ER2FBD4GL2BL
68 DATA R3EU4HL3RD6L
69 DATA NR4U3NR3U3NR4D6
7Ø DATA U3NR3U3NR4D6
71 DATA BRR3U3NLBU3L3GD4BD
72 DATA U6D3R4U3D6BL4
73 DATA BRR2LU6RL2BLBD6
74 DATA BU2DFR2EU5BL4BD6
75 DATA U6D3RNE3NF3LD3
76 DATA NR4NU6
77 DATA U6F2NDE2D6BL4
78 DATA U6F3RU3D6BL4
79 DATA BRR2EU4HL2GD4BD
8Ø DATA U6R3FDGL3D3
81 DATA BUU4ER2FD3G2LHUBR2F2BL4
82 DATA U6R3FDGL3RF3BL4
83 DATA BUFR2EUHL2HUER2FBD5BL4
84 DATA BR2U6R2L4BD6
85 DATA BUU5BR4D5GL2BL
86 DATA BR2UH2U3BR4D3G2DBL2
87 DATA NU6E2NUF2NU6BL4
88 DATA UE4UBL4DF4DBL4
89 DATA BR2U3H2UBR4DG2D3BL2
9Ø DATA NR4UE4UL4BD6
95 DATA BU3NR4BD3BR8
1ØØ DATA BRBURULBU2RULBD5BR7
1Ø5 DATA YOU LOSE,T3L3O1AC
11Ø DATA BUST,L1ØØT1Ø1ABCDEFGAB
C02ABCDEFGABC
115 DATA TIE,T5L5O3AECEA
12Ø DATA YOU WIN,T8L8O3CEACEACEA
AAAA
125 DATA FIVE CARD DRAW,T7L7O1AE
AEAEO2AEAEAEO3AEAEAEL3A
13Ø DATA BLACK JACK,T7L7O1CGCGCG
O2CGCGCGO3CGCGCGL3C
195 PROCEDURES:
2ØØ A$=INKEY$:IFA$=""THEN2ØØ
2Ø5 RETURN
21Ø DRAW"BM=A;,=Z;"
215 RETURN
22Ø B=SGN(88-DH)+1
225 RETURN
23Ø IFPEEK(63Ø3Ø)=15THEN POKE654
97,Ø:ON BRK GOTO1635 ELSE POKE65
495,Ø
235 RETURN
24Ø IFPEEK(63Ø3Ø)=15THEN POKE654
96,Ø ELSE POKE65494,Ø
245 RETURN
25Ø DRAW CARDS:
255 COLOR1:DC=5+(X-1)*5Ø
26Ø LINE(DC,34+DH)-(DC+44,88+DH)
,PSET,BF
265 RETURN
27Ø A=DC+2:Z=41+DH
275 GOSUB21Ø:RETURN
28Ø A=DC+38:Z=87+DH
285 GOSUB21Ø:RETURN
29Ø IFR=1THEN PUT(H,V)-(H+14,V+1
3),HR,PSET:RETURN
295 IFR=2THEN PUT(H,V)-(H+14,V+1
3),DM,PSET:RETURN
3ØØ IFR=3THEN PUT(H,V)-(H+14,V+1
3),CB,PSET:RETURN
3Ø5 PUT(H,V)-(H+14,V+13),SD,PSET
:RETURN
31Ø PUT(H,V)-(H+14,V+13),RC,PSET
:RETURN
315 GOSUB22Ø
32Ø DF(X,B)=1:E=NC
325 FORA=1TO4
33Ø IFCD(NC)<13*A+1 THEN34Ø
335 NEXTA
34Ø N=CD(NC)-13*(A-1):R=A
345 A=238:Z=118:Y=Ø:PN=NC
35Ø COLORØ:GOSUB815
355 NC=NC-1:PN=NC
36Ø COLOR1:GOSUB815
365 GOSUB255:V=42+DH
37Ø IFN>9THEN A=2ELSE A=N
375 AW=A/3:A=INT(AW)
38Ø B=FIX(1Ø*(AW-A))/1Ø
385 IFY=1THEN C=A+1-ABS(SGN(B-.3
)) ELSE C=A+SGN(SGN(B-.5)+1)
39Ø IFSGN(C-1)=1THEN H=DC:GOSUB2
9Ø:H=DC+28:GOSUB29Ø
395 IFSGN(C/2-INT(C/2))=1THEN H=
DC+14:GOSUB29Ø
4ØØ V=V+13:Y=Y+1:IFY<3THEN385
4Ø5 COLORØ
41Ø IFN>9THEN ON N-9GOTO465,495,
52Ø,545ELSE IFN=1THEN A$=LE$(Ø)E
LSE A$=N$(N)
415 GOSUB27Ø:DRAWA$
42Ø GOSUB28Ø:DRAWA$
425 RETURN
43Ø GOSUB255
```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```
435 LINE(DC+5,39+DH)-(DC+39,83+D
H),PRESET,B
440 LINE(DC+6,40+DH)-(DC+38,82+D
H),PRESET,B
445 H=DC+15
450 V=44+DH:GOSUB310
455 V=65+DH:GOSUB310
460 RETURN
465 GOSUB270
470 A$=N$(1)+S1$+LE$(14)
475 DRAW"BL2"+A$:GOSUB280
480 DRAWS2$+A$+"BL26BU23"
485 TS$="TEN":GOSUB705
490 RETURN
495 GOSUB270
500 DRAWLE$(9):GOSUB280
505 DRAWLE$(9)+"BL30BU23"
510 TS$="JACK":GOSUB705
515 RETURN
520 GOSUB270
525 DRAWLE$(16):GOSUB280
530 DRAWLE$(16)+"BL34BU23"
535 TS$="QUEEN":GOSUB705
540 RETURN
545 GOSUB270
550 DRAWLE$(10):GOSUB280
555 DRAWLE$(10)+"BL30BU23"
560 TS$="KING":GOSUB705
565 RETURN
570 TEXT INPUT:
575 D$=LEFT$(D$,LEN(D$)-1)
580 RETURN
585 C$=RIGHT$(B$,1)
590 B$=LEFT$(B$,LEN(B$)-1)
595 RETURN
600 LINE(DC+1,34)-(DC,40),PSET
605 RETURN
610 POKE282,1:B$=""
615 DC=PEEK(195)*256+PEEK(196)
620 GOSUB600:GOSUB200
625 COLOR0:GOSUB600:COLOR1
630 IFA$=CR$AND B$<>""THEN SB$=B
$:RETURN
635 IFA$=BS$THEN675
640 IFLEN(B$)=28THEN615
645 IF"A">A$AND A$<>" "THEN615
650 IF"Z"<A$THEN615
655 IFA$=" "THEN665
660 DRAWLE$(ASC(A$)-65)
665 DRAWS1$
670 B$=B$+A$:GOTO615
675 IFB$=""THEN615
680 GOSUB585
685 IFC$=" "THEN DRAWS2$ELSE COL
OR0:DRAWS2$+LE$(ASC(C$)-65):COLO
R1
690 GOTO615
695 TEXT PRINT:
700 GOSUB210
705 FORC=1TOLEN(TS$)
710 C$=MID$(TS$,C,1)
715 IFC$=" "THEN DRAWS1$ELSE IFC
$="-"THEN DRAWLE$(26)ELSE IFC$="
:"THEN DRAWLE$(27)ELSE DRAWLE$(A
SC(C$)-65)+S1$
720 NEXTC:RETURN
725 NUMERICAL INPUT:
730 DRAW"BM24,20"
735 SOUND10,1:B$=""
740 GOSUB200
745 IFA$="E"THEN1535
750 IFA$=BS$THEN790
755 IFB$<>""THEN IFA$="D"OR A$="
H"THEN BT=VAL(B$):RETURN
760 IF"0">A$OR"9"<A$THEN740
765 D$=B$+A$
770 IFVAL(D$)>CT THEN GOSUB575:G
OTO740
775 IFA$="0"AND B$=""THEN740
780 DRAWN$(VAL(A$))+S1$
785 B$=D$:GOTO740
790 IFVAL(B$)=0THEN740
795 GOSUB575:GOSUB585:COLOR0
800 DRAWS2$+N$(VAL(C$))
805 COLOR1:GOTO740
810 NUMERICAL PRINT:
815 GOSUB210
820 A$=STR$(PN):FORC=2TOLEN(A$)
825 DRAWN$(VAL(MID$(A$,C,1)))+S1
$
830 NEXTC:RETURN
835 SUM CARDS:
840 GOSUB220:PN=S1(B)
845 D=S2(B):TS$=" OR "
850 S1(B)=0:S2(B)=0:AC=0:FL=0
855 FORY=E TO S
860 FORZ=1TO4
865 IFCD(Y)<13*Z+1 THEN875
870 NEXTZ
875 N=CD(Y)-13*(Z-1)
880 IFN=1THEN AC=AC+1 ELSE IFN>9
THEN S1(B)=S1(B)+10 ELSE S1(B)=S
1(B)+N
885 NEXTY:S2(B)=S1(B)+AC
890 IFAC=0THEN900
895 IFS1(B)>11-AC THEN S1(B)=S1(
B)+AC ELSE S1(B)=S1(B)+10+AC
900 A=96:Z=98+DH
905 COLOR0:GOSUB815
910 GOSUB705:PN=D:GOSUB820
915 PN=S1(B):COLOR1:GOSUB815
920 IFS1(B)<>S2(B)AND S1(B)<>21T
HEN GOSUB705:PN=S2(B):GOSUB820:F
L=1
925 RETURN
930 SHUFFLE DECK:
935 A=72:Z=108:PLAY"O1T255L255"
940 TS$="SHUFFLING DECK"
945 GOSUB700:FORX=1TO52
950 B=RND(52):C=RND(52)
955 IFB=C THEN950
960 PLAY"AE"
965 D=CD(B):CD(B)=CD(C)
970 CD(C)=D:NEXTX
975 COLOR0:GOSUB700
980 A=238:Z=118:PN=NC
985 GOSUB815:PN=52:NC=PN
990 COLOR1:GOSUB815
995 RETURN
1000 PRIMARY SCREEN:
1005 CLS:PRINT@235,"BLACK JACK"
1010 PRINT@483,"BY  JAMES RITCHI
E CARROLL"
1015 RETURN
1020 INITIALIZE:
1025 PCLEAR4:CLEAR500
1030 GOSUB1005:SCREEN0,1
1035 IFPEEK(188)=14THEN DA=1:OPE
N"D",#1,"HS",45
1040 GOSUB230:PLAY"V25"
1045 DIMHR(14,13),DM(14,13),CB(1
4,13),SD(14,13),RC(14,13),N$(10)
,LE$(28),RD$(6),P$(6),CD(52),DF(
5,2),S1(2),S2(2)
1050 FORX=0TO9
1055 READN$(X)
1060 NEXT:FORX=0TO27
1065 READLE$(X)
1070 NEXT:FORX=1TO6
1075 READRD$(X),P$(X)
1080 NEXT:FORX=1TO52
1085 CD(X)=X
1090 NEXT:X=RND(-TIMER)
1095 S1$="BR8":S2$="BL8"
1100 BS$=CHR$(8):CR$=CHR$(13)
1105 PMODE4,1:PCLS1:COLOR0
1110 CIRCLE(4,4),3:CIRCLE(10,4),
3:DRAW"BM3,7F4E4":PAINT(4,4),0:P
AINT(10,4),0,0:PAINT(7,5),0,0:PS
ET(7,3,0)
1115 DRAW"BM7,24E5H5G5F5":PAINT(
7,22),0,0
1120 CIRCLE(3,33),2:CIRCLE(11,33
),2:CIRCLE(7,29),2:CIRCLE(7,32),
2:DRAW"BM7,34DG2R4H2DU7D4L4R8"
1125 CIRCLE(4,45),2:CIRCLE(10,45
),2:DRAW"BM2,45E5F5BM7,47DG2R4H2
DBM4,45R6DL6":PAINT(7,43),0,0
1130 DRAW"BM1,59E3U3F3G3F3G3U3H3
BR12H3U3G3F3G3F3U3E3":PAINT(7,59
),0,0:COLOR1
1135 GET(0,0)-(14,13),HR,G
1140 GET(0,13)-(14,26),DM,G
1145 GET(0,26)-(14,39),CB,G
1150 GET(0,39)-(14,52),SD,G
1155 GET(0,52)-(14,65),RC,G
1160 PCLS:SCREEN1:A=88:Z=10
1165 TS$="BLACK JACK":GOSUB700
1170 Z=16:TS$="————"
1175 GOSUB700:A=20:Z=10
1180 TS$="BET-":GOSUB700:A=196
1185 TS$="CREDIT-":GOSUB700
1190 DRAW"BM12,20"+LE$(27)
1195 A=6:Z=98:TS$="PLAYER HAS:"
1200 GOSUB700:Z=186
1205 TS$="DEALER HAS:":GOSUB700
1210 A=150:Z=118
1215 TS$="CARDS LEFT:":GOSUB700
1220 CT=1000:NX=CT:WN=0:NC=0
1225 FORX=1TO5:FORY=1TO2
1230 DF(X,Y)=1:NEXTY,X
1235 'BEGIN:
1240 COLOR0:A=24:Z=20
1245 PN=BT:GOSUB815:A=200
1250 PN=CT:GOSUB815:A=D:Z=108
1255 GOSUB700:A=96:Z=98
1260 PN=S1(2):GOSUB815
1265 TS$=" OR ":GOSUB705
1270 PN=S2(2):GOSUB820:Z=186
1275 PN=S1(1):GOSUB815:GOSUB705
1280 PN=S2(1):GOSUB820
1285 COLOR1:IFBJ=2THEN BT=BT*2
1290 CT=CT+BT*WN
1295 IFCT>NX THEN NX=CT
1300 IFCT>9999999THENA=200:Z=20:
TS$="MAXIMUM":GOSUB700:A=208:Z=3
0:TS$="SCORE":GOSUB700:FORX=1TO4
500:NEXTX:GOTO1535
1305 A=200:Z=20:PN=CT
1310 GOSUB815:DH=0
1315 IFWN<1AND CT=0THEN1535
1320 GOSUB220:FORX=1TO5
1325 IFDF(X,B)=1THEN GOSUB430
1330 DF(X,B)=0:NEXTX
1335 IFDH=0THEN DH=88:GOTO1320
1340 IFNC<9THEN GOSUB935
1345 BJ=0:GOSUB730:GOSUB1380
1350 TS$=RD$(WN)
1355 D=128-4*LEN(TS$)
1360 A=D:Z=108:GOSUB700
1365 PLAYP$(WN):WN=SGN(WN-3)
1370 GOTO1240
1375 PLAYER'S TURN:
1380 DH=0:S=NC
1385 X=1:GOSUB315
1390 X=2:GOSUB315
1395 GOSUB840
1400 IFS1(2)=21THEN BJ=1:GOTO146
5
1405 GOSUB200
1410 IFA$="H"THEN1430
```

```
1415 IFA$="S"THEN1465
1420 IFA$="E"THEN1535
1425 GOTO1405
1430 X=X+1:GOSUB315
1435 GOSUB840
1440 IFS1(2)>21THEN WN=2:RETURN
1445 IFX=5THEN WN=5:BJ=2:RETURN
1450 IFS1(2)=21THEN1465
1455 GOTO1405
1460 DEALER'S TURN:
1465 DH=88:S=NC
1470 X=1:GOSUB315
1475 X=2:GOSUB315
1480 GOSUB840
1485 IFS1(1)=21THEN IFBJ=1THEN W
N=3:RETURN ELSE WN=1:RETURN
1490 IFBJ=1THEN BJ=2:WN=6:RETURN
1495 IFS1(1)>S1(2)THEN WN=1:RETU
RN
1500 IFS1(1)>16THEN IFFL=1THEN15
05 ELSE IFS1(1)<S1(2)THEN WN=4:R
ETURN ELSE IFS1(1)=S1(2)THEN WN=
3:RETURN
1505 X=X+1:GOSUB315
1510 GOSUB840
1515 IFS1(1)>21THEN WN=4:RETURN
1520 IFX=5THEN WN=1:RETURN
1525 GOTO1495
1530 END SCREEN:
1535 PCLS:LINE(170,103)-(213,157
),PSET,BF:COLOR0
1540 DRAW"BM173,110"+LE$(0)+"BM2
07,156"+LE$(0)
1545 R=1:H=185:V=124:GOSUB290
1550 COLOR1:A=1:Z=10
1555 TS$="BLACK JACK-":GOSUB700
1560 A=31:Z=20:TS$="BY JAMES RIT
CHIE CARROLL":GOSUB700
1565 A=5:Z=30:IFDA=1THEN GOSUB24
0:IFLOF(1)=1THEN GET#1,1:INPUT#1
,HS,SB$:GOSUB230
1570 IFHS=0OR NX>HS THENTS$="INP
UT YOUR NAME":GOSUB700:DRAW"BM1,
40"+LE$(26)+"BR9":GOSUB610:HS=NX
:IFDA=1THEN GOSUB240:WRITE#1,HS,
SB$:PUT#1,1:GOSUB230
1575 Z=60:TS$="LAST SCORE:":GOSU
B700:DRAW"BR":PN=NX:GOSUB820
1580 Z=70:TS$="HIGH SCORE:":GOSU
B700:DRAW"BR":PN=HS:GOSUB820
1585 A=3:Z=80:TS$="BY-":GOSUB700
:DRAW"BR":TS$=SB$:GOSUB705
1590 Z=120:TS$="PRESS:":GOSUB700
1595 A=9:Z=130:TS$="S-TO STOP GA
ME":GOSUB700
1600 Z=140:TS$="P-TO PLAY AGAIN"
:GOSUB700
1605 A=4:Z=180:TS$="RAINBOW-":GO
SUB700
1610 A=19:Z=190:TS$="THE COLOR C
OMPUTER MAGAZINE":GOSUB700
1615 GOSUB200
1620 IFA$="S"THEN1635
1625 IFA$="P"THEN1160
1630 GOTO1615
1635 GOSUB1005:GOSUB240
1640 POKE282,255:CLOSE
1645 END
```


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by Paul Miller

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Something old, something new;
From monochrome to Red-Green-Blue

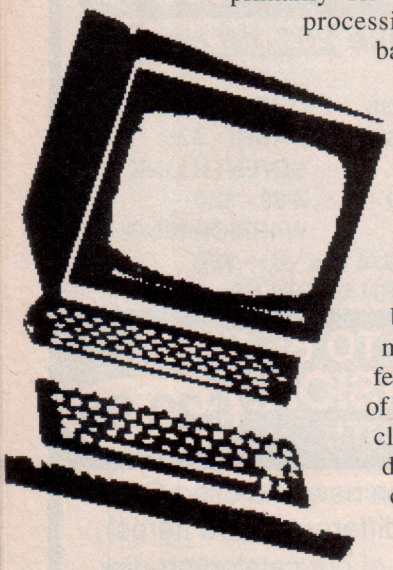
A Monitor for the CoCo 3

by Marty Goodman

Many of the questions asked in my "CoCo Consultations" column focus on which monitor to buy for a CoCo, or if a particular type of monitor will work with a CoCo. Some years ago THE RAINBOW published an article I wrote about such matters (August 1987, Page 68). This article is meant as a brief update to that piece.

Monochrome Monitors

For those who want to use their CoCo 3 primarily for text (word processing, database, spreadsheet, etc.) applications, a monochrome monitor remains, by far, the most cost-effective means of providing a clear, crisp display. You can choose any make or model (green, amber or white) provided it is a composite video (also known as NTSC video) type monitor. IBM-type (also called TTL and Hercules) monitors and gray-scale VGA monitors will not work. Composite monitors typically have a single RCA phono jack in back for connection to the computer. IBM-type monochrome monitors typically have a connector or cable with connector of the DB-9 (trapezoidal with two rows of 4 and 5 pins) sort. Among monochrome composite monitors, the quality of display is generally so good there is little reason to prefer one brand to another. Such monitors sell new for around $75 to $100 (see ads from Howard Medical and Microcom) and often are found used at Ham, or computer, swap meets for as little as $30. The sharpness of the display on such a monochrome monitor is typically superior to a $400 RGB color monitor. Note that those with composite monochrome monitors can still hook their computers to television sets for occasional games or other applications requiring color.



Composite Color Monitors

Most middle- and higher-priced television sets now have video inputs and can act as a composite color monitor for connection to a VCR or your Color Computer 3. The connector is typically an RCA phono jack. Using composite video to connect the CoCo to a TV or monitor usually removes any RF interference (wavy lines) associated with connecting the CoCo to the TV via its antenna connector. However, composite-color video (quite unlike composite-monochrome video) offers almost no improvement in resolution over use of the antenna connector and cannot resolve better than 40 or 50 columns of text in an easily readable fashion. I would judge composite color as suitable only for games and medium- to low-resolution graphics applications, and not for 80-column text displays.

RGB Monitors

RGB is a generic technical term that is used in the description of a wide variety of quite different color monitors. The term RGB specifies that the Red, Green and Blue signal information is carried on separate wires. However, this term in itself says nothing about other aspects of the signal critical to the issue of whether or not a given monitor can be used with the CoCo 3. The CoCo 3 requires the RGB monitor to recognize an analog signal. That is, the voltage of the R, G and B lines of the CoCo 3 vary between 0 and .9 volts. It also requires the monitor accept synchronization information sent at TTL (0 to 5 volts) signal levels along with separate horizontal and vertical sync signals sent in the form of positive (upgoing) pulses. To properly display the signal from the CoCo 3's RGB port, a monitor must sync at a horizontal frequency of 15.75 KHz. To fully specify the type of RGB signal produced by the CoCo 3, you would have to call it an analog RGB, 15.75KHz, separate positive TTL-level sync signal.

IBM CGA monitors are RGB monitors that accept separate positive TTL-level sync signals and will sync at 15.75 KHz. However, their R, G and B inputs are not analog, but TTL-level. What this means is that in most

---

Martin H. Goodman, M.D., a physician trained in anesthesiology, is a longtime electronics tinkerer and outspoken commentator. On Delphi, Marty is the SIGop of RAINBOW's CoCo SIG. His non-computer passions include running, mountaineering and outdoor photography.

cases you can hook a CoCo 3 to a CGA monitor and get a useable image if you connect all like-named lines on the CoCo 3 to the CGA video input and ignore (leave disconnected) the CGA monitor's Intensity line. The image from this method resolves only six colors plus black and white, not the full 64 colors available with analog monitors. Such a display is often adequate for 80-column text display, but may not be pleasing with games and drawing programs that make full use of the color capabilities of the CoCo 3. I personally have converted several CGA monitors to analog monitors by bypassing their TTL video inputs and feeding the CoCo's signal just beyond. The exact means of doing this varies with each make and model of CGA monitor.

At the time of my last article on this subject, there were two monitors I especially recommended: the Magnavox 8CM515 and the Sony KV1311CR. Both of these have since been discontinued by the manufacturers and are no longer available. However, I am happy to report that Magnavox introduced the 1CM135, a model that replaces the 8CM515. It is sold by Microcom, Howard Medical and Computer Plus for somewhat under $300. The 1CM135 offers the same resolution (.42 mm dot pitch) as the old 8CM515 and can accept CoCo-type RGB analog and IBM-type CGA RGB signals as well as composite video and audio signals. The 1CM135's analog RGB is similar to the 8CM515 and can accept any type of TTL sync information (separate or combined, negative or positive). The 1CM135 has the added capabilities of accepting Chromanance-Luminance video (for use with S-VHS systems and Commodore 128's) and provisions for input of stereo sound. For those looking for an excellent color monitor for their CoCo 3 and who have an interest in using it with advanced VCRs, the 1CM135 is an excellent choice. I highly recommend it.

Tandy makes the CM-8 specifically for the CoCo 3. It is adequate, but its lack of flexibility of video inputs and relatively coarse resolution screen (.52 mm dot pitch) make it a distinctly poor choice when compared to the 1CM135. CM-8 owners looking for something to do with them other than use them as CoCo monitors may want to refer to the November 1990 (Page 25) issue of THE RAINBOW where I detail how to hook a CM-8 monitor to a SEGA Genesis video system to get a superb RGB display. You can also hook a CM-8 to a CGA RGB video output and often get a readable image. Doing so involves simply hooking lines with the same names on the monitor and CGA output together and ignoring the Intensity line of the CGA output. You will only get six colors plus black and white, instead of the 14 colors plus black and white CGA normally displays. There is also a chance that doing this could harm the CM-8 video input circuitry, which was intended to see voltage levels of between 0 and .9 volts, not the 0- to 5-volt signal levels CGA provides.

RGB monitors designed to work with the Atari ST-series of computers and the Commodore Amiga can work with the CoCo 3. Such monitors use the same type of RGB signals, the same horizontal sync frequency and TTL signal levels as the CoCo 3. However, you may have to mess with the polarity of the sync signals from the CoCo 3 to get an image. Atari STs use separate, but negative, sync pulses. You may have to run the CoCo's HSYNC and VSYNC signals through inverter gates to make them negative before an Atari monitor will show a proper image. Amiga monitors are often set up to accept composite negative sync signals. You can convert the CoCo 3's separate positive HSYNC and VSYNC signals into a single composite negative sync signal by feeding the CoCo 3's HSYNC and VSYNC lines into the two inputs of a NOR gate (74LS02 chip). The output of that gate will be composite negative sync.

The two new OS-9/68000 systems introduced by Kenneth Leigh and Frank Hogg Laboratories are designed to work with exactly the same kind of analog RGB video as used by the CoCo 3. Thus, a Magnavox 1CM135 works nicely with them. However, if you are considering investing in one of those systems, consider getting a higher-resolution multisync monitor such as those discussed below.

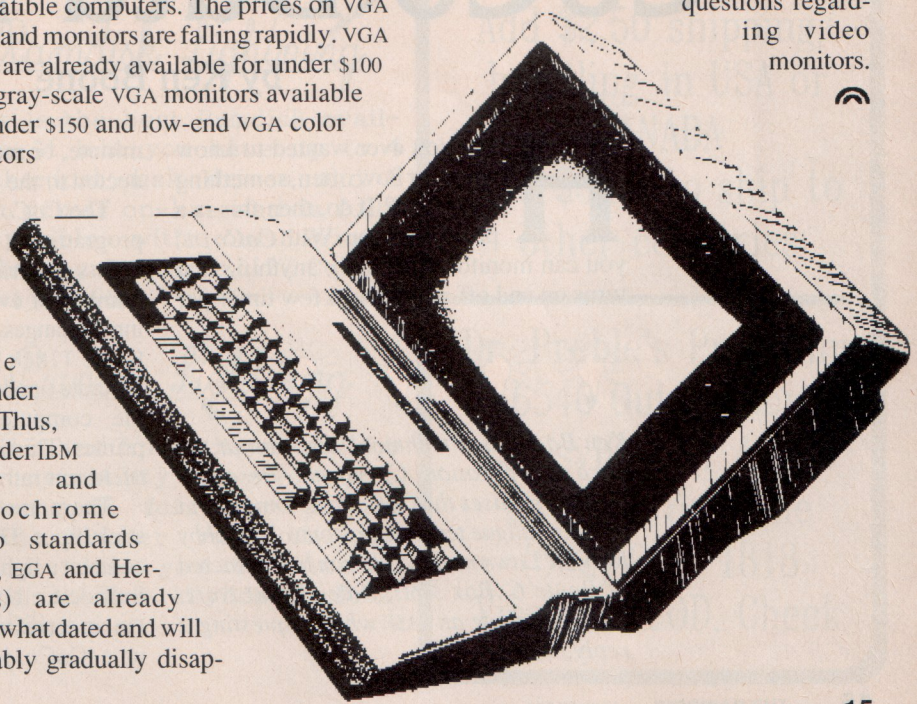
VGA and Multisync Monitors

VGA will soon likely be the single type of video display used in the world of PC-compatible computers. The prices on VGA cards and monitors are falling rapidly. VGA cards are already available for under $100 with gray-scale VGA monitors available for under $150 and low-end VGA color monitors available for under $300. Thus, the older IBM color and monochrome video standards (CGA, EGA and Hercules) are already somewhat dated and will probably gradually disappear from the marketplace of MS-DOS desktop computers.

VGA monitors are typically VGA-only monitors that require a horizontal sync frequency of 31.5 KHz, double that of the CoCo 3. Such monitors will not work with a CoCo 3. However, multisync-type monitors are common in the IBM VGA marketplace. These monitors accept RGB signals at a variety of horizontal sync frequencies, including the 15.75 KHz signal emitted by the CoCo 3. Some of the less fancy multisync monitors can be purchased for as little as $400 or less. These monitors give an excellent display when used with the CoCo 3 and have the added advantage of being useable with IBM VGA systems. To use them with a CoCo 3, however, you have to make your own cable. Most of the time this involves no more than running like-named signals from the CoCo to the multisync monitor.

[*Editors Note: If you plan to purchase a multisync monitor, be absolutely certain to check the specifications to ensure the monitor can sync at 15.75 KHz. Many of the newer low-end multisync monitors can sync between 31.5 and 35 KHz only. Also, be aware of the newer "dual-sync" monitors that can sync at either 31.5 KHz or 35 KHz and nothing in between. These monitors are becoming quite popular since most VGA and Super-VGA cards use 31.5 KHz sync signals for resolutions up to 640-by-480 and 35 KHz for 800-by-600 and 1024-by-768 resolutions.*]

As a convenience to those seeking to make their own cables, I make 10-conductor, six-foot ribbon cables with a CoCo-style RGB connector (10-pin IDC female, dual-row) crimped to one end of the cable. I am available via THE RAINBOW and the Delphi CoCo SIG for questions regarding video monitors.



An eventful program for monitoring the real world

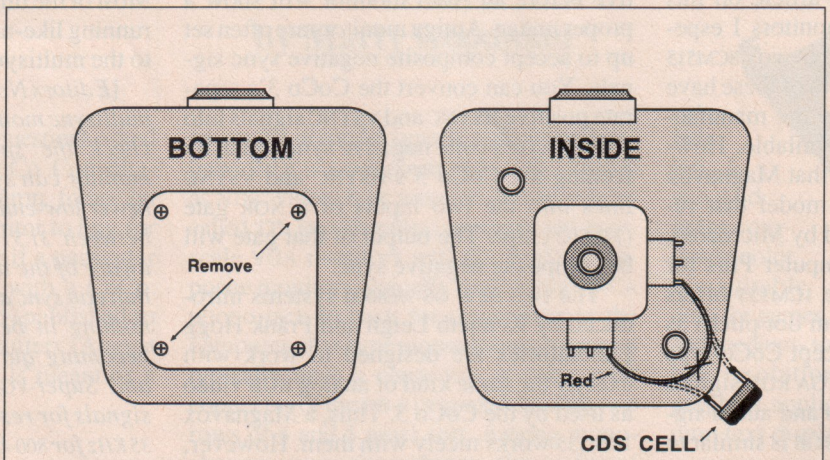


Figure 1

CoCo Data Logger

by Ken Boone

Have you ever wanted to know when, or how often, something happened? If so, then this is a project for you. With *CoCo DL*, you can monitor practically anything that turns on and off more than a few times per minute, or most anything that can be connected to the CoCo joystick input.

Ken Boone is a technical assistant at the Lord Corporation Corporate Research Center. He uses the CoCo to automate and monitor fatigue tests and to control a Hobby Robotic Lawn mower. He can be contacted at Route 6, Box 336D, Raleigh, NC 27612. Please include an SASE when requesting a reply.

The *CoCo Data Logger* (*CoCo DL*) is a program that monitors one of the joystick inputs and prints the time as well as the total number of events every time the joystick input changes. Keep time with the Extended BASIC TIMER function. This function is an accurate timekeeper, however, it stops when the computer communicates with the printer. This interruption causes the *CoCo DL* to run rather slowly.

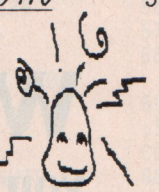
There are many ways to vary the joystick input. The easiest and safest way is to connect a light detector such as a Cadmium Sulfide Cell (CDS; Radio Shack Cat. #276-116) in series with one of the potentiometers in a CoCo joystick. The CDS cell goes

The Freedom Series

Vocal Freedom

Vocal Freedom turns your computer into a digital voice recorder. The optional Hacker's Pac lets you incorporate voices or sounds that you record into your own BASIC or ML programs. This is not a synthesizer. Sounds are digitized directly into computer memory so that voices or sound effects sound very natural. One "off-the-shelf" application for Vocal Freedom is an automatic message minder. Record a message for your family into memory. Set Vocal Freedom on automatic. When Vocal Freedom "hears" any noise in the room, it plays the prerecorded message directly from its Random Access Memory with amazing fidelity! You may also SAVE or LOAD sounds to and from DISK. VF also tests memory to take advantage of from 64K up to a full 512K. Imagine being able to create a library of Sound Effects to be activated on demand for your home Videos. Imagine being able to create simple BASIC programs that talk or even sing in a perfectly natural human voice. YOURS! Imagine using the optional Hacker's Pac to write a simple spelling program for your kids. The computer can pronounce any word, the child would be asked to type it. The applications are virtually unlimited! Requires low cost amplifier (RS cat. #277-1008) and any microphone. Will run on a CoCo 1, 2, or 3. Vocal Freedom Disk: $34.95. Optional Hacker's Pac Disk: $19.95. Disk for both: $49.95

Mental Freedom



Would your friends be impressed if your computer could read their minds? Mental Freedom uses the techniques of Biofeedback to control video game action on the screen. Telekinesis? You control the action with your thoughts and emotions. Your goal is to materialize and levitate objects with the power of your mind while avoiding the insidious cobra. Mental Freedom teaches peace of mind in the face of adversity. Mental Freedom even talks in a perfectly natural voice without using a speech synthesizer! Requires Radio Shack's low cost Biofeedback monitor, Cat. #63-675. Will run on a CoCo 2 or 3 but not CoCo 1. Disk: $24.95

Lightning Series

These three utilities give real power to your CoCo 3.

Ramdisk Lightning

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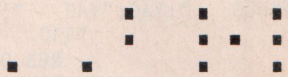
COCO Braille



Produce standard grade 2 Braille on a Brother daisy wheel printer. Easy to use for sighted or blind user. No knowledge of Braille is necessary. Call for free sample. Will run on CoCo 1, 2, or 3. Disk: $69.95

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VDOS, The Undisk, ramdisk for the CoCo 1 or 2 only. Available only on tape: $24.95

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Visa, MC, COD, Check

With CoCo DL, you can monitor practically anything that can be connected to the CoCo joystick input.

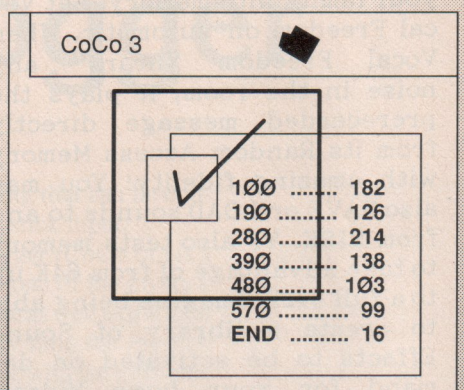
between the potentiometer and the 5-volt source. To modify the joystick, remove the two screws as shown in Figure 1. Open the case and cut the red wire between the two potentiometers. Connect the CDS cell to the ends of the cut red wire. When you want to use your joystick, simply remove the CDS cell and re-connect the wire.

After modifying the joystick, plug it into the right joystick input on the CoCo, pull the joystick lever all the way back, then run the program. Watch the input readings change on the screen as you point the CDS in the correct range.

The second section is based on a FOR/NEXT loop that loops once per second for 60 loops (lines 380 to 690). During each pass, the loop prints on the screen the time, day and total count with lines 390 through 410. Line 420 tests and loops back on itself until the TIMER function has reached one second. Then Line 430 zeros the timer. The joystick input is read by lines 440 and 450. To read Joystick 1, you must first read Joystick 0. The input, the On setpoint, and the Off setpoint are then printed on the screen. Lines 490 through 530 test to determine if the input has changed and if anything needs to be printed. This determination is based on the values of the input, the On and Off setpoints, and the flag variables. Lines 540 through 670 contain the screen and printer routines that print when the input changes. Lines 570 and 580 contain a test to determine if the printer is ready to print. This test keeps the computer from locking up if the printer is not connected or is not online. After the 60th time through the loop (one minute), the program jumps to the section that keeps up with the minute, hour and day; lines 330 through 370. Then the program re-enters the loop.

With *CoCo DL*, the input must stay above the On setpoint or below the Off setpoint for more than a second to reliably catch a cycle. It also miscounts if a cycle happens while the computer is communicating with the printer. Another counting problem occurs when the difference between the On and Off input signal is very small or the *hysteresis* is set too small. The hysteresis is the difference between the On and Off setpoints. In these small hysteresis and signal conditions, noise on the input signal can cause false counts.

If you would like to add a clock to one of your programs, just use lines 200-400, 420, 430, 690 and 700. ❑



The Listing: COCODL

```
10 '****************************
20 '**    COCO DATA LOGGER     **
30 '**    BY KENNETH R.BOONE   **
40 '**    RT. 6, BOX 336D      **
50 '**    RALEIGH, NC 27612    **
55 '**    COPYRIGHT MARCH 1991 **
```

```
60 '**   BY FALSOFT, INC.      **
65 '**   RAINBOW MAGAZINE      **
70 '****************************
80 'THIS PROGRAM USES THE JOYSTI
CK INPUT AND ACTS AS A TIME EVEN
T LOGGER.
90 CLS
100 INPUT "SELECT OUTPUT TYPE:
          0=PRINT TIME ON.
          1=PRINT TIME ON AND T
IME OFF.    ";POFF
110 IF POFF=0 OR POFF=1 THEN GOT
O 120 ELSE GOTO 100
120 CLS
130 INPUT "SELECT PRINTER ON (0)
          OR PRINTER OFF     (2)
.";PRTTEST
140 IF PRTTEST=0 OR PRTTEST=2 TH
EN GOTO 150 ELSE GOTO 130
150 CLS
160 INPUT "ENTER TURN ON SETPOIN
T BETWEEN  1 AND 63";SPON
170 IF SPON > 0 AND SPON < 64 TH
EN GOTO 180 ELSE GOTO 160
180 CLS
190 INPUT "ENTER TURN OFF SETPOI
NT, WHICH  MUST BE LESS THAN TUR
N ON       SETPOINT";SOFF
200 IF SOFF < SPON AND SOFF >= 0
 THEN GOTO 210 ELSE GOTO 190
210 CLS
220 INPUT "SET THE TIME. WHAT HO
UR IS IT?    (1 TO 24)";HOUR
230 IF HOUR>=1 AND HOUR<=24 THEN
 GOTO 240 ELSE GOTO 220
240 CLS
250 INPUT "WHAT MINUTE IS IT";MI
NUTE
260 IF MINUTE>=0 AND MINUTE<=59
THEN GOTO 270 ELSE GOTO 250
270 CLS
280 INPUT "THE TIMER WILL START
WHEN YOU   PRESS ENTER";X
290 CLS
300 DAY=0:COUNT=0:FLAG=0
310 GOTO 380
320 H=0:D=D+1
330 MINUTE=-1
340 IF HOUR=24 THEN GOTO 320
    'IS DAY UP?
350 HOUR=HOUR+1
360 IF MINUTE=59 THEN GOTO 330
    'IS HOUR UP?
370 MINUTE=MINUTE+1
380 FOR SECOND=0 TO 59
390 PRINT @48,HOUR;":";MINUTE;":
";SECOND
400 PRINT @80,"DAY ";DAY
410 PRINT @112,"COUNT";COUNT
420 IF TIMER>=60 THEN GOTO 430 E
LSE GOTO 420   'IS SECOND UP?
430 TIMER=0      'RESET TIMER
440 IN=JOYSTK(0)  'JOYSTK 0 MUST
    BE READ BEFORE 1
450 IN=JOYSTK(1)
460 PRINT @144,"INPUT";IN
    'PRINT TIME ON ONLY?
470 PRINT @176,"ON SETPOINT ";SP
ON
480 PRINT @208,"OFF SETPOINT";SO
FF
490 IF IN>SPON AND FLAG=0 THEN G
OTO 610
500 IF IN>SPON AND FLAG=1 THEN G
OTO 690
510 IF IN<SOFF AND FLAG=0 THEN G
OTO 690
520 IF IN<SOFF AND FLAG=1 THEN F
LAG=0
530 IF POFF=0 THEN GOTO 690
540 PRINT HOUR;":";MINUTE;":";SE
COND;"   DAY";DAY
550 PRINT "COUNT";COUNT;"   OFF"
560 IF PRTTEST=2 THEN GOTO 690
570 PRTTEST=(PEEK(&HFF22) AND 1)
580 IF PRTTEST=1 THEN GOTO 690
    'PRTTEST=1 PRINTER NOT READY
590 PRINT#-2,HOUR;":";MINUTE;":"
;SECOND;"   DAY";DAY;"   COUNT";
COUNT;"   OFF"
600 GOTO 690
610 COUNT=COUNT+1
620 PRINT HOUR;":";MINUTE;":";SE
COND;"   DAY";DAY
630 PRINT "COUNT";COUNT;"   ON"
640 IF PRTTEST=2 THEN GOTO 680
650 PRTTEST=(PEEK(&HFF22) AND 1)
660 IF PRTTEST=1 THEN GOTO 680
670 PRINT#-2,HOUR;":";MINUTE;":"
;SECOND;"   DAY";DAY;"    COUNT"
;COUNT;"   ON"
680 FLAG=1
690 NEXT SECOND
700 GOTO 360
```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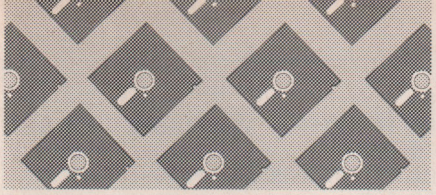


Visualizing Fractions 4

by Fred B. Scerbo
Contributing Editor

Last month's program, *Visualizing Fractions 3* was a lengthy listing that provides a rather useful instructional tool for showing students the relationship between visually represented fractions and their decimal equivalents. This month, *Visualizing Fractions 4* offers the next logical step in that progression — the representation of these fractions as percentages.

To make the task of entering this program easier, I have taken every precaution to make this listing similar to the previous listing. The only differences are 1/3 of the data lines. All other lines, with a few exceptions, have been kept consistent.

Therefore, rather than wasting too much space going over old ground, let's go straight to the meat of the matter and quickly get this program into your CoCo's memory.

The Shortcut

If you have a working copy of VISFRAC3 saved, load it into memory. The lines indicated below are the only ones you need to re-enter to create VISFRAC4.

2	590	1010
20	610	1030
25	630	1050
30	650	1070
35	670	1090
40	690	1110
45	710	1130
50	730	1150
60	750	1170
95	770	1190
285	790	1210
290	810	1230
295	830	1250
365	850	1270
370	870	1290
375	890	1310
380	910	1330
385	930	1350
390	950	1370
550	970	1390
570	990	1410

Changing the lines above while VISFRAC3 is already in memory changes that program into a working copy of VISFRAC4.

The reverse can also be done if you read this month's column and did not read last month's. Get a copy of last month's issue, load VISFRAC4 and type in the lines listed above from the VISFRAC3 listing with just these differences — keep lines 285, 290, 295, 365, 370, 375, 380, 385 and 390 of VISFRAC4 instead.

Oops!

There seems to be a slight bug in last month's listing of VISFRAC3. It is not a major problem and does not really affect the running of the program. If you have VISFRAC3, retype lines 285, 290, 295, 365, 370, 375, 380, 385 and 390 with the lines from VISFRAC4.

It seems that in some rare instances

32K Extended

```
25 ..... 153    6Ø5 ..... 1Ø9    112Ø ..... 131
55 ..... 1Ø3    645 ..... Ø      116Ø ..... 233
85 ..... 53     685 ..... 1Ø3    12ØØ ..... 16
125 ..... 2Ø7   725 ..... 132    124Ø ..... 7Ø
15Ø ..... 95    765 ..... 5      1275 ..... 23Ø
2Ø5 ..... 51    8Ø5 ..... 165    13ØØ ..... 33
255 ..... 195   84Ø ..... 2Ø6    133Ø ..... 162
3Ø5 ..... 2Ø8   88Ø ..... 197   136Ø ..... 252
355 ..... 9     91Ø ..... 169   139Ø ..... 139
4Ø5 ..... 88    945 ..... 3     1425 ..... 47
445 ..... 45    98Ø ..... 2Ø4   1475 ..... 35
48Ø ..... 191   1Ø1Ø ..... 236  END ..... 138
515 ..... 25    1Ø45 ..... 226
565 ..... 254   1Ø8Ø ..... 116
```

The Listing: VISFRAC4

```
1 REM*****************************
2 REM* VISUALIZING FRACTIONS 4 *
3 REM*   COPYRIGHT (C) 1990    *
4 REM*     BY FRED B. SCERBO     *
5 REM*       6Ø HARDING AVE      *
6 REM*  NORTH ADAMS, MA Ø1247  *
```

Fred Scerbo is a special needs instructor for the North Adams Public Schools in North Adams, Massachusetts. He holds a master's in education and has published some of the first software available for the Color Computer through his software firm, Illustrated Memory Banks.

when using selection C (Reverse Quiz), the graphics might not always be accurate as far as the painting is concerned in the graphics of the fraction. These changes prevent that problem. As I said, it only seems to have an effect on a few of the graphics images and it really does not change the outcome of the quiz. This change just makes everything consistent.

Running the Program

VISFRAC4 is very easy to use. Press ENTER after the titlecard for the menu. Selection A lets you review all the fractions and percentages by pressing ENTER. In both selections B and C, the quiz is run by using the space bar to arrive at your match with the choice in the upper left corner. Press ENTER to record it. The ENTER key also advances you to the next problem.

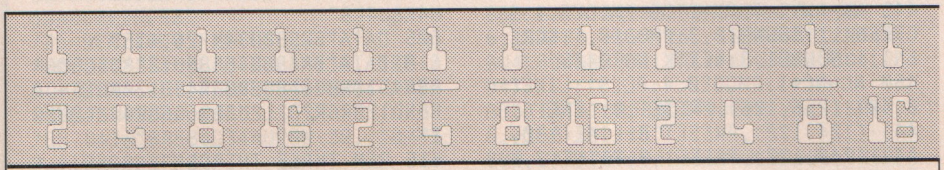
As with all our programs, press @ to see your score. Press C to continue where you left off.

Conclusion

VISFRAC4 appears to be the logical conclusion to the fractions series for now, but I will not rule out VISFRAC5 if some of you indicate a new area for this study in fractions. As always, I remain eager to accept your suggestions here in the "Wishing Well."

See you next month.

If you have an idea for the "Wishing Well," submit it to Fred c/o THE RAINBOW. *Remember, keep your ideas specific, and don't forget this is* BASIC. *All programs resulting from your wishes are for your use, but remain the property of the author.*



```
7 REM**************************
10 CLEAR800
15 CLS0:PRINTSTRING$(32,172);STR
ING$(32,204);:FORI=1TO 224 :READ
 A:PRINTCHR$(A+128);:NEXT
20 DATA45,44,44,42,46,44,45,37,4
4,45,37,44,45,37,44,46,45,36,46,
37,44,45,36,46,34,45,40,46,45,69
,80,69
25 DATA37,,,40,42,,37,37,,37,37,
,36,36,,42,36,,42,37,,37,,42,42,
37,,42,,69,80,69
30 DATA37,,,34,42,,37,37,16,37,3
7,,,,,42,,,42,37,,37,32,42,37,37
,112,42,,69,80,69
35 DATA21,28,28,26,30,29,28,21,2
8,29,21,,,,,26,,,26,21,,21,,26,2
0,23,,28,29,68,76,77
40 DATA21,,,,26,21,,21,,21,21,,,
,,26,,,26,21,,21,,26,,31,,,21,,8
0,69
45 DATA53,,,48,58,52,58,53,48,53
,53,,53,48,,58,,48,58,53,,53,48,
58,,53,48,50,53,,80,69
50 DATA60,56,,52,60,,60,52,,52,5
2,60,60,,52,60,48,52,60,52,60,60
,52,60,48,60,56,60,60,80,80,68
55 PRINTSTRING$(32,195);STRING$(
32,163);
60 PRINT@388," VISUALIZING FRACT
IONS 4 ";
65 PRINT@420,"    BY FRED B.SCER
BO     ";:PRINT@452,"   COPYRIGH
T (C) 1990    ";
70 X$=INKEY$:IFX$<>CHR$(13)THEN7
0
75 DIM P$(44,4),A$(6),A(44),N(44
),B(4),C(4),D(4),E(4),F(4),G(44)
80 FORI=1TO3:READ C(I),D(I),E(I)
,F(I):NEXT:FORI=1TO6:READA$(I):N
EXT:FORI=1TO44:READP$(I,1),P$(I,
2),P$(I,3):NEXT:FORI=1TO44:READG
(I):P$(I,4)="BR":NEXT
85 COLOR1,0:FORI=1TO9:P$(I,1)=O$
+P$(I,1):NEXTI
90 REM TITLE
95 CLS:PRINTSTRING$(64,"=");:PRI
NT@68,"VISUALIZING FRACTIONS 4":
PRINTSTRING$(64,"=");:PRINT@198,
"A) REVIEW FRACTIONS":PRINT@262,
"B) QUIZ GRAPHICS":PRINT@326,"C)
 REVERSE QUIZ"
100 PRINT@388,"<<<SELECT YOUR CH
OICE>>>"
105 PRINT:PRINTSTRING$(32,"=");
110 X$=INKEY$:X=RND(-TIMER):IFX$
="A"THEN505ELSEIFX$="B"THEN115EL
SEIFX$="C"THEN1510ELSE110
115 CLS0:PMODE0,1:PCLS1
120 LINE(0,0)-(254,170),PRESET,B
125 LINE(6,4)-(122,82),PRESET,B
130 LINE(128,4)-(248,82),PRESET,
B
135 LINE(6,86)-(122,164),PRESET,
B
140 LINE(128,86)-(248,164),PRESE
T,B
145 DRAW"BM26,188C0NU10R10NU10BR
6R10U6L10U4R10BR6NR10D4NR10D6R10
BR12BU6NE4D2F4BR6R10U6L10U4R10BR
6ND10R10D4NL10BR6NR10D6U10R10D10
BR6NR10U10R10BR6NR10D4NR10D6R10B
R10U10NL4R10D4NL10D6NL14BR6U10R1
0D4NL10D6BR6U10R10D4L10R4F6BR6E4
U2H4"
150 DATA130,6,246,80,6,86,120,16
2,130,86,246,162
155 PAINT(2,2),0,0:PCOPY1TO3
160 PMODE0,4:PCLS1
165 LINE(0,0)-(254,170),PRESET,B
F
170 LINE(6,4)-(122,82),PSET,B
175 LINE(128,4)-(248,82),PSET,B
180 LINE(6,86)-(122,164),PSET,B
```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```
185 LINE(128,86)-(248,164),PSET,
B
190 PCOPY4TO2:PMODE0,1:SCREEN1,1
195 DATA"BM2,8C0S4","BM130,8C0S4
","BM2,90C0S4","BM130,90C0S4","B
M2,48C0S4","BM130,48C0S4"
200 FORI=1TO44
205 A(I)=RND(44):IFN(A(I))=1THEN
205
210 N(A(I))=1:NEXTI:FORY=1TO44:C
OLOR1,0
215 FORI=2TO4
220 B(I)=RND(3)+1:IFN(B(I))=0THE
N220
225 N(B(I))=0:NEXTI:FORI=1TO4:N(
I)=1:NEXT
230 B=RND(44):IFB=A(Y)THEN230
235 IFG(B)=G(A(Y))THEN230
240 C=RND(44):IFC=B OR C=A((Y))T
HEN240
245 IFG(C)=G(A(Y))THEN240
250 DRAW A$(1):DRAWP$(A(Y),1):IF
 NG=1THEN265
255 CIRCLE(60,42),34,0,.9:PAINT(
56,20),0,0
260 DRAW A$(1):DRAW"C1":DRAWP$(A
(Y),2)
265 DRAW A$(B(2)):DRAWP$(B,3)
270 DRAW A$(B(3)):DRAWP$(C,3)
275 DRAW A$(B(4)):DRAWP$(A(Y),3)
280 IF NG=0THEN315
285 CIRCLE(188,42),34,0,.9:PAINT
(184,18),0,0
290 CIRCLE(60,124),34,0,.9:PAINT
(56,98),0,0
295 CIRCLE(188,124),34,0,.9:PAIN
T(184,98),0,0
300 DRAW A$(B(3))+"C1":DRAWP$(C,
4)
305 DRAW A$(B(4))+"C1":DRAWP$(A(
Y),4)
310 DRAW A$(B(2))+"C1":DRAWP$(B,
4)
315 COLOR1,0
320 Z=0
325 PMODE0,4
330 DRAW A$(1)+"C1":DRAWP$(A(Y),
1):IF NG=1THEN345
335 CIRCLE(60,42),34,1,.9:PAINT(
56,20),1,1
340 DRAW A$(1):DRAW"C0":DRAWP$(A
(Y),2)
345 DRAW A$(B(2))+"C1":DRAWP$(B,
3)
350 DRAW A$(B(3))+"C1":DRAWP$(C,
3)
355 DRAW A$(B(4))+"C1":DRAWP$(A(
Y),3)
360 IF NG=0THEN395
365 CIRCLE(188,42),34,1,.9:PAINT
(184,34),1,1
370 CIRCLE(60,124),34,1,.9:PAINT
(56,116),1,1
375 CIRCLE(188,124),34,1,.9:PAIN
T(184,116),1,1
380 DRAW A$(B(2))+"C0":DRAWP$(B,
4)
385 DRAW A$(B(3))+"C0":DRAWP$(C,
4)
390 DRAW A$(B(4))+"C0":DRAWP$(A(
Y),4)
395 PMODE0,1:SCREEN1,1
400 LINE(8,6)-(120,80),PSET,B
405 IF Y>44THEN RUN
410 X$=INKEY$:IFX$=" "THEN420ELS
EIFX$="@"THEN1445
415 COLOR1,0:LINE(8,6)-(120,80),
PRESET,B:GOTO400
420 Z=Z+1:IFZ=4THENZ=1
425 COLOR1,0:LINE(C(Z),D(Z))-(E(
Z),F(Z)),PSET,B
430 X$=INKEY$:IFX$=" "THEN420ELS
EIFX$=CHR$(13)THEN440ELSEIFX$="@
"THEN1445
435 COLOR1,0:LINE(C(Z),D(Z))-(E(
Z),F(Z)),PRESET,B:GOTO425
440 IFZ+1=B(4)THEN450
445 NW=NW+1:FORK=1TO5:PMODE0,4:S
CREEN1,1:SOUND10,3:PMODE0,1:SCRE
EN1,1:SOUND1,3:NEXTK:GOTO425
450 NC=NC+1:PMODE0,4:PCLS1:LINE(
0,40)-(256,126),PRESET,B:LINE(6,
44)-(124,122),PRESET,B:LINE(130,
44)-(248,122),PRESET,B:PAINT(2,4
2),0,0
455 DRAW A$(5)+"S4":DRAWP$(A(Y),
1):IFNG=1THEN465
460 CIRCLE(60,82),34,0,.9:PAINT(
54,60),0,0
465 DRAWA$(5)+"C1":DRAWP$(A(Y),2
)
470 DRAW A$(6):DRAWP$(A(Y),3):IF
NG=0THEN480
475 CIRCLE(188,82),34,0,.9:PAINT
(170,80),0,0
480 DRAWA$(6)+"C1":DRAWP$(A(Y),4
)
485 SCREEN1,1
490 X$=INKEY$:IFX$<>CHR$(13)THEN
490
495 PMODE0,1
500 PCOPY3TO1:SCREEN1,1:PCOPY2TO
4:NEXTY:GOTO1445
505 PMODE0,2:PCLS1:SCREEN1,1:LIN
E(0,40)-(256,126),PRESET,B:LINE(
6,44)-(124,122),PRESET,B:LINE(13
0,44)-(248,122),PRESET,B:PAINT(2
,42),0,0
510 FORI=1TO44:DRAW A$(5)+"S4":C
IRCLE(60,82),34,0,.9:DRAWP$(I,1)
:PAINT(54,60),0,0:DRAWA$(5)+"C1"
:DRAWP$(I,2)
515 DRAWA$(6)+"C0":DRAWP$(I,3):D
RAWA$(6):DRAWP$(I,4)
520 X$=INKEY$:IFX$<>CHR$(13)THEN
520
525 COLOR1,0:LINE(8,46)-(122,120
),PSET,BF:LINE(132,46)-(246,120)
,PSET,BF:NEXTI
530 RUN
535 REM ONE HALF
540 DATA"BR58BD34NU28ND28BR44BD1
2NR8U4R8U4L8BU4L2R12L6BU4U8"
545 DATA
550 DATA"BR34BD46S8R8U6L8U6R8BR4
R8D12L8U12BR12R2D2L2U2BR6G6BR6U2
L2D2R2"
555 REM TWO HALVES
560 DATA
565 DATA"BR58BD34NU28ND28BR44BD1
2C0NR8U4R8U4L8BU4L2R12L6BU4R4L8U
4R8U4L8"
570 DATA"BR24BD46S8R4L2U12NGBR6B
D12R8U12L8D12BR12R8U12L8ND12BR12
R2D2L2U2BR6G6BR6U2L2D2R2"
575 REM ONE THIRD
580 DATA"BR58BD34NU28M-26,+15M+2
6,-15M+26,+15BR20BU2R8U4NL8U4L8B
U4L2R12L6BU4U8"
585 DATA
590 DATA"BR18BD46S8R7U6NL7U6NL7B
R4R7D6NL7D6NL7BR4RBR4R7U6NL7U6NL
7BR4R2D2L2U2BR6G6BR6U2L2D2R2"
595 REM TWO THIRDS
600 DATA"BR58BD34NU28M+26,+15BR2
0BU2R8U4NL8U4L8BU4L2R12L6BU4R4L8
U4R8U4L8"
605 DATA"BR58BD34M-26,+15"
610 DATA"BR18BD46S8NU12R8U6L8U6R
8BR4D12R8U6L8U6R8BR4BD12RBU12ND2
R8ND12BR6R2D2L2U2BR6G6BR6U2L2D2R
2"
615 REM THREE THIRDS
620 DATA
625 DATA"BR58BD34NU28M-26,+15M+2
6,-15M+26,+15BR20BU2C0R8U4NL8U4L
8BU4L2R12L6BU4L4R8U4NL8U4L8"
630 DATA"BR24BD46S8R4L2U12NGBR6B
D12R8U12L8D12BR12R8U12L8ND12BR12
R2D2L2U2BR6G6BR6U2L2D2R2"
635 REM ONE FOURTH
640 DATA"BR58BD34NU28ND28NL32R32
BR22BD12U8D4L8U4BU4L2R12L6BU4U8"
645 DATA
650 DATA"BR34BD46S8NR8U6R8U6NL8B
R4NR8D6R8D6L8BU12BR12R2D2L2U2BR6
G6BR6U2L2D2R2"
655 REM TWO FOURTHS
660 DATA"BR58BD34NU28ND28R32BR22
BD12U8D4L8U4BU4L2R12L6BU4R4L8U4R
8U4L8"
665 DATA"BR58BD34L32"
670 DATA"BR34BD46S8R8U6L8U6R8BR4
R8D12L8U12BR12R2D2L2U2BR6G6BR6U2
L2D2R2"
675 REM THREE FOURTHS
680 DATA"BR58BD34NU28R32BR22BD12
U8D4L8U4BU4L2R12L6BU4L4R8U4NL8U4
L8"
685 DATA"BR58BD34NL32D28"
690 DATA"BR34BD46S8BU12ND2R8D12B
R4R8U6L8U6R8BR4R2D2L2U2BR6G6BR6U
2L2D2R2"
695 REM FOUR FOURTHS
700 DATA
705 DATA"BR58BD34NU28ND28NL32R32
BR22BD12C0U8D4L8U4BU4L2R12L6BU4B
R4U8D4L8U4"
710 DATA"BR24BD46S8R4L2U12NGBR6B
D12R8U12L8D12BR12R8U12L8ND12BR12
R2D2L2U2BR6G6BR6U2L2D2R2"
715 REM ONE FIFTH
720 DATA"BR58BD34NU28M-30,-10M+3
0,+10M+30,-10M-30,+10NG22NF22BR4
6BD12R8U4L8U4NR8BU4L2R12L6BU4U8"
725 DATA
730 DATA"BR32BD46S8NR8U6R8U6NL8B
```

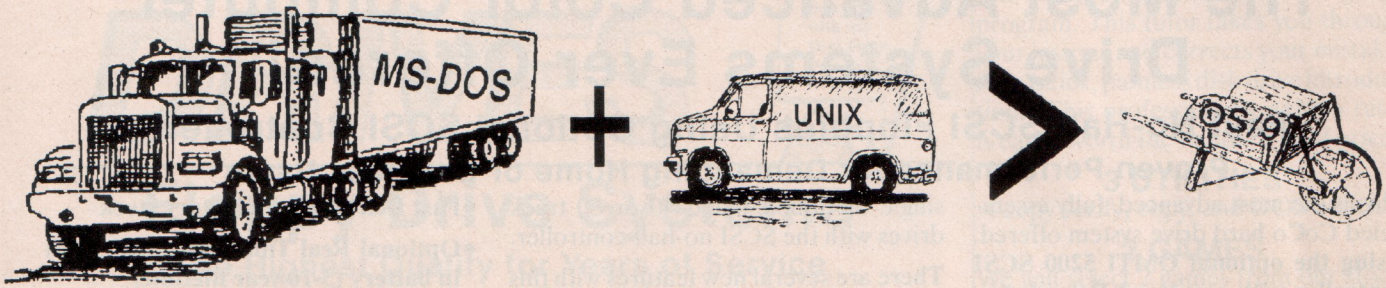
1 1 1

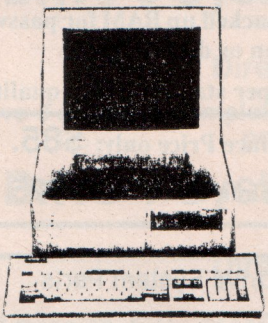
```
1030 DATA"BR18BD46S8BU10U2R8D12B
R6NU12BR6RBR4BU12D6R8U6ND12BR6R2
D2L2U2BR6G6BR6U2L2D2R2"
1035 REM SIX SEVENTHS
1040 DATA"BR58BD34NU28M+24,-20BR
28BD32U8L8ND2BU4L2R12L6BU4NL4R4U
4L8ND4U4R8"
1045 DATA"BR58BD34M-24,-20M+24,+
20M-30,+4M+30,-4M-16,+25M+16,-25
M+16,+25M-16,-25M+30,+4"
1050 DATA"BR18BD46S8NU12R8U6NL8U
6NL8BR4NR8D6R8D6NL8BR3RBR3BU10U2
R8ND12BR6R2D2L2U2BR6G6BR6U2L2D2R
2"
1055 REM SEVEN SEVENTHS
1060 DATA
1065 DATA"BR58BD34NU28M-24,-20M+
24,+20M-30,+4M+30,-4M-16,+25M+16
,-25M+16,+25M-16,-25M+30,+4M-30,
-4M+24,-20BR28BD32C0U8L8ND2BU4L2
R12L6BU4BR4U8L8D2"
1070 DATA"BR24BD46S8R4L2U12NGBR6
BD12R8U12L8D12BR12R8U12L8ND12BR1
2R2D2L2U2BR6G6BR6U2L2D2R2"
1075 REM ONE EIGHTH
1080 DATA"BR58BD34NU28ND28NL32NR
32NE22NF22NG22NH22BR44BD12NU4R8U
8D4L8U4NR8BU4L2R12L6BU4U8"
1085 DATA
1090 DATA"BR18BD46S8NU12BR5NR8U6
R8U6NL8BR5BD12RBR4BU12NR8D6R8D6N
L8BU12BR6R2D2L2U2BR6G6BR6U2L2D2R
2"
1095 REM TWO EIGHTHS
1100 DATA"BR58BD34NU28ND28NL32NR
32NE22NF22NG22BR44BD12NU4R8U8D4L
8U4NR8BU4L2R12L6BU4R4L8U4R8U4L8"
1105 DATA"BR58BD34NH22"
1110 DATA"BR34BD46S8NR8U6R8U6NL8
BR4NR8D6R8D6L8BU12BR12R2D2L2U2BR
6G6BR6U2L2D2R2"
1115 REM THREE EIGHTHS
1120 DATA"BR58BD34NU28ND28NR32NE
22NF22NG22BR44BD12NU4R8U8D4L8U4N
R8BU4L2R12L6BU4L4R8U4NL8U4L8"
1125 DATA"BR58BD34NH22NL32"
1130 DATA"BR18BD46S8R7U6NL7U6NL7
BR4ND2R7D12BR5RBR4R7U6L7U6R7BR4R
2D2L2U2BR6G6BR6U2L2D2R2"
1135 REM FOUR EIGHTHS
1140 DATA"BR58BD34NU28ND28NR32NE
22NF22BR44BD12NU4R8U8D4L8U4NR8BU
4L2R12L6BU4BR4U8D4L8U4"
1145 DATA"BR58BD34NH22NL32NG22"
1150 DATA"BR34BD46S8R8U6L8U6R8BR
4R8D12L8U12BR12R2D2L2U2BR6G6BR6U
2L2D2R2"
1155 REM FIVE EIGHTHS
1160 DATA"BR58BD34NU28NR32NE22NF
22BR44BD12NU4R8U8D4L8U4NR8BU4L2R
12L6BU4L4R8U4L8U4R8"
1165 DATA"BR58BD34NH22NL32NG22ND
28"
1170 DATA"BR12BD46S8NU12R8U6NL8B
U6NL8BR4R7D6L7D6R7BR4RBR4R7U6L7U
6R7BR6R2D2L2U2BR6G6BR6U2L2D2R2"
1175 REM SIX EIGHTHS
1180 DATA"BR58BD34NU28NR32NE22BR
44BD12NU4R8U8D4L8U4NR8BU4L2R12L6
BU4L4NU4R8U4L8U4R8"
1185 DATA"BR58BD34NH22NL32NG22ND
28NF22"
1190 DATA"BR34BD46S8BU12ND2R8D12
BR4R8U6L8U6R8BR4R2D2L2U2BR6G6BR6
U2L2D2R2"
1195 REM SEVEN EIGHTHS
1200 DATA"BR58BD34NU28NE22BR44BD
12NU4R8U8D4L8U4NR8BU4L2R12L6BU4B
R4U8L8D2"
1205 DATA"BR58BD34NH22NL32NG22ND
28NF22NR32"
1210 DATA"BR14BD46S8NU12R7U6NL7U
6NL7BR4ND2R7D12BR5RBR3R7U6L7U6R7
BR6R2D2L2U2BR6G6BR6U2L2D2R2"
1215 REM EIGHT EIGHTHS
1220 DATA
1225 DATA"BR58BD34NU28ND28NL32NR
32NE22NF22NG22NH22BR44BD12C0NU4R
8U8D4L8U4NR8BU4L2R12L6BU4L4R8U4N
L8U4L8D8"
1230 DATA"BR24BD46S8R4L2U12NGBR6
BD12R8U12L8D12BR12R8U12L8ND12BR1
2R2D2L2U2BR6G6BR6U2L2D2R2"
1235 REM ONE NINTH
1240 DATA"BR58BD34NU28M-18,-22M+
18,+22M-30,-6M+30,+6M-26,+15M+26
,-15M-12,+26M+12,-26M+12,+26M-12
,-26M+26,+15M-26,-15M+30,-6M-30,
+6M+18,-22BR26BD34R8U4NU4L8U4NR8
BU4L2R12L6BU4U8"
1245 DATA
1250 DATA"BR24BD46S8NU12BR7NU12B
R7RBR7U12BR6R2D2L2U2BR6G6BR6U2L2
D2R2"
1255 REM TWO NINTHS
1260 DATA"BR58BD34NU28M-30,-6M+3
0,+6M-26,+15M+26,-15M-12,+26M+12
,-26M+12,+26M-12,-26M+26,+15M-26
,-15M+30,-6M-30,+6M+18,-22BR26BD
34R8U4NU4L8U4NR8BU4L2R12L6BU4R4L
8U4R8U4L8"
1265 DATA"BR58BD34M-18,-22"
1270 DATA"BR14BD46S8NR8U6R8U6NL8
BR4R8D6L8D6R8BR4RBR4NR8U6R8U6NL8
BR6R2D2L2U2BR6G6BR6U2L2D2R2"
1275 REM THREE NINTHS
1280 DATA"BR58BD34NU28M-26,+15M+
26,-15M-12,+26M+12,-26M+12,+26M-
12,-26M+26,+15M-26,-15M+30,-6M-3
0,+6M+18,-22BR26BD34R8U4NU4L8U4N
R8BU4L2R12L6BU4L4R8U4NL8U4L8"
1285 DATA"BR58BD34M-18,-22M+18,+
22M-30,-6"
1290 DATA"BR18BD46S8R7U6NL7U6NL7
BR4R7D6NL7D6NL7BR4RBR4R7U6NL7U6N
L7BR4R2D2L2U2BR6G6BR6U2L2D2R2"
1295 REM FOUR NINTHS
1300 DATA"BR58BD34NU28M-12,+26M+
12,-26M+12,+26M-12,-26M+26,+15M-
26,-15M+30,-6M-30,+6M+18,-22BR26
BD34R8U4NU4L8U4NR8BU4L2R12L6BU4B
R4U8D4L8U4"
1305 DATA"BR58BD34M-18,-22M+18,+
22M-30,-6M+30,+6M-26,+15"
1310 DATA"BR12BD46S8BU12D6R8U6ND
12BR4D6R8U6D12BR4RBR4BU12D6R8D6U
12BR6R2D2L2U2BR6G6BR6U2L2D2R2"
1315 REM FIVE NINTHS
1320 DATA"BR58BD34NU28M+12,+26M-
12,-26M+26,+15M-26,-15M+30,-6M-3
0,+6M+18,-22BR26BD34R8U4NU4L8U4N
R8BU4L2R12L6BU4L4R8U4L8U4R8"
1325 DATA "BR58BD34M-18,-22M+18,
+22M-30,-6M+30,+6M-26,+15M+26,-1
5M-12,+26"
1330 DATA"BR14BD46S8R8U6L8U6R8BR
4NR8D6R8D6NL8BR4RBR4NU6R8U6L8U6R
8BR4R2D2L2U2BR6G6BR6U2L2D2R2"
1335 REM SIX NINTHS
1340 DATA"BR58BD34NU28M+26,+15M-
26,-15M+30,-6M-30,+6M+18,-22BR26
BD34R8U4NU4L8U4NR8BU4L2R12L6BU4L
4NU4R8U4L8U4R8"
1345 DATA"BR58BD34M-18,-22M+18,+
22M-30,-6M+30,+6M-26,+15M+26,-15
M-12,+26M+12,-26M+12,+26"
1350 DATA"BR18BD46S8NU12R8U6L8U6
R8BR4D12R8U6L8U6R8BR4BD12RBU12ND
2R8ND12BR6R2D2L2U2BR6G6BR6U2L2D2
R2"
1355 REM SEVEN NINTHS
1360 DATA"BR58BD34NU28M+30,-6M-3
0,+6M+18,-22BR26BD34R8U4NU4L8U4N
R8BU4L2R12L6BU4BR4U8L8D2"
1365 DATA "BR58BD34M-18,-22M+18,
+22M-30,-6M+30,+6M-26,+15M+26,-1
5M-12,+26M+12,-26M+12,+26M-12,-2
6M+26,+15"
1370 DATA"BR14BD46S8BU10U2R8ND12
BR3ND2R8D12BR4RBR4U12R8D6NL8D6NL
8U12BR6R2D2L2U2BR6G6BR6U2L2D2R2"
1375 REM EIGHT NINTHS
1380 DATA"BR58BD34NU28M+18,-22BR
26BD34R8U4NU4L8U4NR8BU4L2R12L6BU
4L4R8U4NL8U4L8D8"
1385 DATA"BR58BD34M-18,-22M+18,+
22M-30,-6M+30,+6M-26,+15M+26,-15
M-12,+26M+12,-26M+12,+26M-12,-26
M+26,+15M-26,-15M+30,-6"
1390 DATA"BR12BD46S8NU12R8U6NL8U
6NL8BR4D12R8U6L8U6R8D12BR4RBR4BU
6U6R8D6NL8D6NL8U12BR6R2D2L2U2BR6
G6BR6U2L2D2R2"
1395 REM NINE NINTHS
1400 DATA
1405 DATA"BR58BD34NU28M-18,-22M+
18,+22M-30,-6M+30,+6M-26,+15M+26
,-15M-12,+26M+12,-26M+12,+26M-12
,-26M+26,+15M-26,-15M+30,-6M-30,
+6M+18,-22BR26BD34C0R8U4NU4L8U4N
R8BU4L2R12L6BU4L4R8U8L8D4R8"
1410 DATA"BR24BD46S8R4L2U12NGBR6
BD12R8U12L8D12BR12R8U12L8ND12BR1
2R2D2L2U2BR6G6BR6U2L2D2R2"
1415 DATA .5,1,.333,.667,1
1420 DATA .25,.5,.75,1,.2,.4,.6,
.8,1
1425 DATA .167,.333,.5,.667,.833
,1
1430 DATA .143,.286,.429,.571,.7
14,.857,1
1435 DATA .125,.25,.375,.5,.625,
.75,.875,1
1440 DATA .111,.222,.333,.444,.5
56,.667,.778,.889,1
1445 CLS:PRINT:PRINT:PRINT
1450 PRINTTAB(3)"PROBLEMS COMPLE
TED  = "NC+NW:PRINT
1455 PRINTTAB(3)"CORRECT RESPONS
ES   = "NC:PRINT
1460 PRINTTAB(3)"INCORRECT RESPO
NSES = "NW:PRINT
1465 TR=NC+NW:IFTR=0THENTR=1
1470 SC=INT(NC/TR*100)
1475 PRINTTAB(3)"YOUR TOTAL SCOR
E    = "SC"%":PRINT
1480 PRINTTAB(3)"ANOTHER TRY (Y/
N) OR (C) ?";
1485 X$=INKEY$:IFX$=""THEN1485
1490 IFX$="Y"THEN RUN
1495 IFX$="N"THEN CLS:END
1500 IFX$="C"THEN SCREEN1,1:GOTO
400
1505 GOTO1485
1510 CLS:PRINT@232,"PLEASE STAND
 BY";
1515 FORI=1TO44:TEM$=P$(I,1):P$(
I,1)=P$(I,3):P$(I,3)=TEM$:NEXT
1520 FORI=1TO44:TEM$=P$(I,2):P$(
I,2)=P$(I,4):P$(I,4)=TEM$:NEXT
1525 NG=1:GOTO115
```

Would You Buy a Car You Couldn't Get Fuel For?

Why Buy a Computer You Can't Get Software For?

Many of you are now considering an alternative to the Color Computer to run OS/9. Are you really going to invest in an untried alternative with very limited software? Why not buy a computer that will run a UNIX Compatible (OS/9 like) operating system AND MS-DOS. According to published articles, this combination of industry-standard operating systems would run more than 90% of ALL of the software that has EVER been written. Compare the software bases represented below. We call these systems the OWL ATom.™ Can your alternative to the CoCo be fixed locally? On-site service is available most areas on the ATom.





These highly adaptable computers we call the **OWL ATom™** series. They are not newcomers to the computer world, but are the current versions of computers which we have been building for more than 6 years. All systems can be configured with your choice of hard drive, graphics monitor, and 6 different processors. The systems described here are typical of the new versions of our line which offer 2 industry-standard operating systems.

OWL ATom™ ET or SX

For general features of our OWL ATom including expansion capabilities, check out the table below. Comparisons are also given to several Tandy™ computers. The resolution of the optional VGA is also given.

Typical system components:
Processor: 80286-12 or 80386SX-16
Floppy drive: 1.2 or 1.44 Meg
Memory: 1MB
Hard Drive: 40 MB, 28 ms.
Monitor: TTL Monochrome (720X350)

MS-DOS Software:
MS-DOS (with all utilities)
GWBASIC
Integrated Software including:
Desktop Organizer with tracker
Outliner
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Spelling Checker
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Line Editor
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Over 1500 pages and VHS Tape

One of the best features is the price:

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First year on-site service $45 (Most areas)
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FEATURES	OWL ATom	2500 XL*	1000 TL/2*
Processor (Speed)	80286(12)	80286(10)	80286(8)
Total Slots	8	3	4
16 Bit Slots	6	3	0
Standard Memory	1024K	1024K	640K
Max. on Board RAM	4096K	1024K	768K
Graphics Output	VGA	VGA	CGA
Max. Resolution	1024X768	640X480	640X200
Drive Slots	5	3	3
Hard Drive Interface	Yes(16 Bit)	Yes(16 Bit)	Yes(8 Bit)
Floppy Drive	1.2 or 1.44 Meg	1.44 Meg	720K
Power Supply (Watts)	200	70	67
Warranty (Parts and Labor)	1 Year	1 Year	1 Year

* Trademarks as follows: Model numbers -Tandy Corporation, MS-DOS- Microsoft, Inc., OS/9 -MicroWare, Inc., UNIX- AT&T, Inc.

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Proven Performance for Demanding Home or Business Users

This is the most advanced, fully assembeled CoCo hard drive system offered. **Using the optional OMTI 5200 SCSI controller with our Hard Drive Interface, our new system will support no-halt floppy drives.** You need not wait while typing or worry about clock time losses. Why be limited to 3 floppy drives? A complete system could now consist of 1-3 standard CoCo floppy drives, 1-2 (or more) hard drives, and 1-3 no-halt floppies using standard (not just CoCo) OS/9 format. You can use single or double-sided 40 or 80 track drives with the SCSI no-halt controller.

There are several new features with this improved interface. These include:

- **Full SASI/SCSI compatible (this allows many add-ons to the versatile SCSI buss)**
- **No-Halt Floppies with optional SCSI controller allows full type-ahead during access**
- **Low factory-direct prices**
- **Fast Delivery from factory stock**
- **Optional Real Time Clock with built in battery (3-10 year lifetime)**
- **With the Clock you have 240 Bytes of battery backed up RAM for password protection or data storage!**
- **Same super stable LRTech quality**

Interface Price only: $85.

Real Time Clock-RAM: $25.

20 or 30 Meg. 40 Meg. 80 Meg.

System Prices: (Includes Hard Drive, case, & fan, SCSI Controller*, LR/OWL Interface, Software. Fully assembled and tested.)

$495. $535. $875.

Super System Prices: (LR/OWL System as above but OMTI 5200 SCSI Controller AND 3.5" or 5.5" HD 80 Track Floppy in same case)

$595. $645. $1039. (2 cases)

*SCSI controller is OMTI 5100. Add $75 for OMTI 5200 with FDC.

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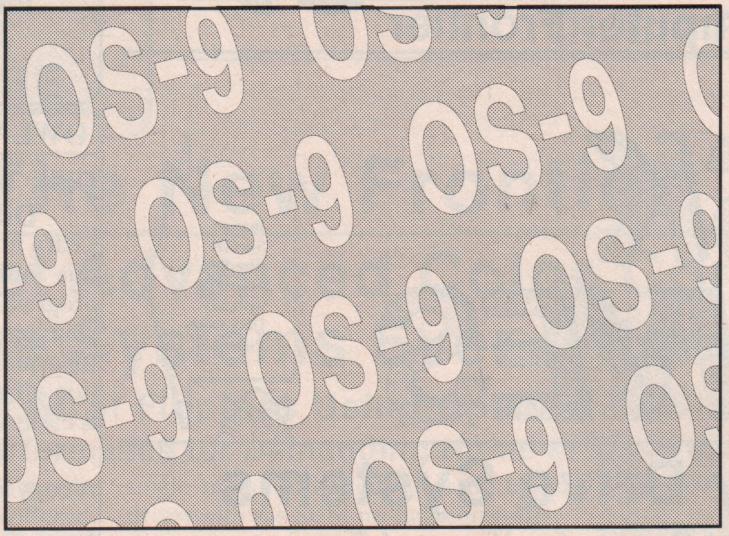

SORT

by Stephen B. Goldberg

Another "sort" article? Well, yes and no. This is a decent, in-memory sort program. It is used to sort items found on single lines in a text file. But what I'd really like to demonstrate is a simple memory management trick I've never seen used in an OS-9 program in THE RAINBOW.

The sort algorithm is not too efficient, but it's very stingy with RAM, which was what I needed when I wrote it for my first Level I system. The original program used a default buffer size of 3.5K and required the user to manually increase the buffer size to sort larger files.

I got tired of checking the file size before each sort and devised this program that matches its buffer size (up to the maximum amount of memory available) to any size file. No more memory than absolutely necessary is ever used.

In the listing, you'll see that each time the buffer fills while reading text, Register D is set to zero and the `F$Mem` system call is executed, returning the current data area size in Register D. After the program adds 1K to the current size in D, the same system call is used to make the buffer larger. The stack is moved to the new top of the data area (which is pointed to by Register Y) to prevent writing over the stack with the incoming text and causing a system crash. Text input continues to the end of the file, or until the buffer fills again. If the file is too large after all available memory is used or there is insufficient disk space, `sort` aborts and deletes the destination file.

Using the Program

To sort a file, type `sort`, the name or pathlist of the file to be sorted and the name or pathlist of the file to get the sorted text, and press ENTER. For example:

```
sort phone.list sorted.list
```

If the destination filename is omitted, output is via the standard output path and can be viewed on the screen, redirected to another device, or used to feed a pipeline. The following line sends a sorted phone list to the printer:

```
sort phone.list >/p
```

If both source and destination are not given, then standard input and output paths are used. The following line uses a pipe to redirect the output of the list command as the standard input for the `sort` command:

```
list file1 file2 file3 ! sort >/p
```

One last caution for Level I users — if other processes are active while `sort` is functioning, there may not be sufficient contiguous memory available and the data size should be specified on the command line. For example:

```
sort bigfile #20k ! uniq >/p
```

❑

Stephen Goldberg is a dentist and the author of the Utilipak *series of OS-9 utilities. He can be contacted at 695 Plainview Road, Bethpage, NY 11714. Please include an SASE when requesting a reply.*

Listing 1: sort.asm

```
*************************************************
*
* SORT - COPYRIGHT (c) 1988 by S. B. GOLDBERG
*
* Use: sort [input_file [sorted_file]]
*
         ifp1
         use   /dd/defs/os9defs
         endc
*
         mod   len,name,prgrm+objct,reent+1,entry,dsiz
*
outname  rmb   50              output filename buffer
inpath   rmb   1               input path number
outpath  rmb   1               output path number
pointer  rmb   2               buffer pointer
compline rmb   2               comparison line pointer
bufend   rmb   3               buffer end address
buffer   rmb   3637            default line buffer
         rmb   200             stack
         rmb   200             parameters
dsiz     equ   .
*
name     fcs   /Sort/
         fcb   4               edition number
         fcc   /(c)1988 S.Goldberg/
*******************************
* INITIALIZE
*******************************
entry    clr   inpath          standard input path
         lda   #1              standard output path
         sta   outpath         save it
         decb                  parameters?
         beq   stdpath         no, standard input and output
         os9   i$open          open input file
         bcs   out             exit with error
         sta   inpath          save input path number
         lda   ,x              next parameter character
         cmpa  #$0d            output filename?
         beq   stdpath         no, standard output path
         pshs  u               save data pointer
movename lda   ,x+             output filename character
         sta   ,u+             to filename buffer
         cmpa  #$0d            end of parameters?
         bne   movename        no, move another character
         ldx   ,s              output filename pointer
         lda   #write.         write mode
         ldb   #$0b            attr ----r-wr
         os9   i$create        create output file
         bcs   out             exit with error
         sta   outpath         save output path number

* File to file sort.  Pre-set output file size for speed.

         lda   inpath          input path number
         ldb   #ss.size        file size function
         os9   i$getstt        get input file size
         lda   outpath         output path number
         os9   i$setstt        set output file size
         puls  u               retrieve data pointer
         bcs   delete          no room, delete output file
stdpath  leax  buffer,u        start of buffer
         stx   pointer         save it
mvstack  tfr   y,s             reset stack pointer
         leay  -400,y          end of buffer
         sty   bufend          save it
*******************************
* READ LINES TO BE SORTED
*******************************
getline  ldy   #200            maximum line length
         lda   inpath          input path number
         os9   i$readln        read a line
         bcs   error           branch on error
         tfr   y,d             line length
         incb                  add byte for line length storage
         stb   -1,x            save current line length
         leax  d,x             bump pointer for next line
         stx   pointer         save next line address
         cmpx  bufend          buffer full?
         bls   getline         no, get next line

* Buffer full, enlarge buffer by 1K if RAM is available.

         clra                  zero D register
         clrb
         os9   f$mem           get current data memory size
```


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To permit access to the largest software base available, an MS-DOS board, the ALT86, will be available shortly as a low-cost option. This board has a V30 (8086) microprocessor running at 10 MHz, includes 1 Meg of 0-wait state RAM, uses the Chips and Technology BIOS, comes with MS-DOS 3.3 or 4.01 and plugs into one of the SYSTEM IV expansion slots. Additionally, an OS9/6809 software emulator/interpreter will be available soon. This emulator/interpreter will permit running most COCO OS9/6809 software on the SYSTEM IV.

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The design of the SYSTEM IV is derived from previously successful designs and uses components that have been tested and proven in other systems. SYSTEM IV's uniqueness stems from the ability of its designer and manufacturer, Peripheral Technology, to provide well designed, reliable hardware at a low cost. Further, only the functions necessary to the basic operation have been designed into the mother board. Seven PC/XT compatible expansion slots allow an unrestricted selection of standard PC/XT accessory boards by the user. The user is not locked into any preconceived notions of what is best.

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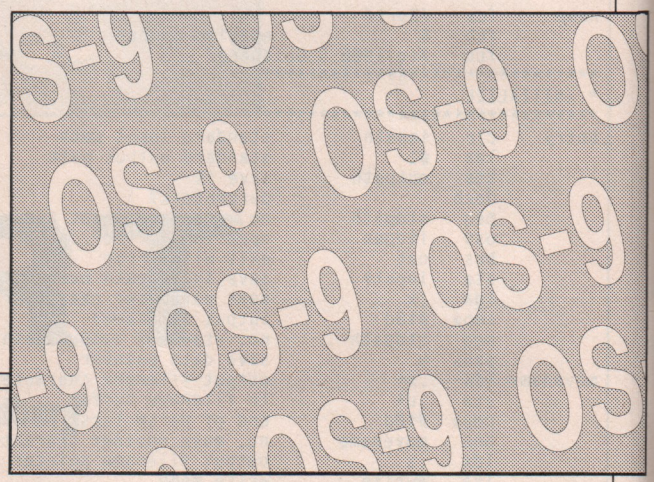
```
         addd  #$400          add 1K
         os9   f$mem          enlarge memory area by 1K
        bcc   mvstack       no error, set new stack pointer

* Delete output file if insufficient RAM or disk space.

delete   lda   outpath        output path number
         cmpa  #1             standard output path?
         beq   out            yes, quit with error
         os9   i$close        no, close output file
         tfr   u,x            output filename pointer
         os9   i$delete       delete output file
out      os9   f$exit         quit program
*
error    cmpb  #e$eof         end of file?
         bne   out            no, quit with other error
         ldx   pointer        end of last line
         clr   -1,x           mark end of file
         clr   ,x
*****************************
* SORT THE LINES
*****************************
sort     leax  buffer,u       buffer pointer
sort1    stx   pointer        save it
         ldb   -1,x           line length
         beq   out            if end of sort, quit
         clra                 zero msb
         leay  d,x            first comparison line
sort2    tst   ,y             comparison already sorted?
        bmi   nextcomp       yes, find next comparison line
         sty   compline       save comparison line pointer
         lda   ,x             line already sorted?
         bmi   switch         yes, get next unsorted line
         ldb   -1,y           comparison length
         beq   print          if end of pass, output line
         cmpa  ,y             match comparison character?
         beq   compare        yes, compare rest of line
        bhi   switch        comparison lower, switch pointer
nextcomp ldb   -1,y           comparison line length
         clra                 zero msb
        leay  d,y           address of next comparison line
         bra   sort2          check new comparison line

compare  decb                 lines the same?
         beq   newcomp        yes, get new comparison
         lda   ,x+            no, get next character
         cmpa  ,y+            compare
         beq   compare        same, compare next characters
        bhi   switch        comparison lower, switch pointer
newcomp  ldx   pointer         retrieve buffer pointer
        ldy   compline      retrieve comparison line pointer
         bra   nextcomp       find next comparison line
switch   ldx   compline       new line pointer
         bra   sort1          continue sorting
*****************************
* OUTPUT SORTED LINE
*****************************
print    ldy   #200           maximum line length
         lda   outpath        output path number
         os9   i$writln       output line
         bcs   out            branch on error
         com   ,x             flag line as sorted
         bra   sort           continue sort
*
         emod
len      equ   *
         end
```



Listing 2: MakeSort.b09

```
PROCEDURE MakeSort
 0000      (* Generates the binary module sort *)
 0026      (* Level I - change all /dd to /d0 *)
 004B      DIM path,byt:BYTE
 0056      DIM count:INTEGER
 005D      PRINT "Creating sort . . .";
 0075      CREATE #path,"/dd/cmds/sort":WRITE
 008D      FOR count=1 TO 255
 009D        READ byt
 00A2        PUT #path,byt
 00AC      NEXT count
 00B7      CLOSE #path
 00BD      PRINT
 00BF      SHELL "attr /dd/cmds/sort e pe"
 00DA      END
 00DC      DATA 135,205,0,255,0,13,17,129,215,0,36,16,0,83,111,114
 0110      DATA 244,4,40,99,41,49,57,56,56,32,83,46,71,111,108,100
 0144      DATA 98,101,114,103,15,50,134,1,151,51,90,39,52,16,63,132
 0178      DATA 37,112,151,50,166,132,129,13,39,39,52,64,166,128,167
 01A9      DATA 192,129,13,38,248,174,228,134,2,198,11,16,63,131,37
 01DA      DATA 83,151,51,150,50,198,2,16,63,141,150,51,16,63,142,53
 020E      DATA 64,37,51,48,200,59,159,52,31,36,49,169,254,112,16,159
 0242      DATA 56,16,142,0,200,150,50,16,63,139,37,43,31,32,92,231
 0276      DATA 31,48,139,159,52,156,56,35,232,79,95,16,63,7,195,4
 02AA      DATA 0,16,63,7,36,210,150,51,129,1,39,8,16,63,143,31,49
 02E1      DATA 16,63,135,16,63,6,193,211,38,249,158,52,111,31,111
 0312      DATA 132,48,200,59,159,52,230,31,39,234,79,49,139,109,164
 0343      DATA 43,17,16,159,54,166,132,43,35,230,63,39,35,161,164
 0374      DATA 39,9,34,25,230,63,79,49,171,32,228,90,39,8,166,128
 03A8      DATA 161,160,39,247,34,7,158,52,16,158,54,32,231,158,54
 03D9      DATA 32,197,16,142,0,200,150,51,16,63,140,37,170,99,132
 040A      DATA 32,179,252,141,86
```

How Cold *is* It?

by Tony DiStefano
Contributing Editor

Previously, we looked at how to interface an analog signal to the CoCo using the ADC0804 analog-to-digital converter. This month we'll use another analog part to complete the electronic thermometer. The part in question is an LM34 Precision Fahrenheit Temperature Sensor. This little gem accurately measures temperature in the range of -50 to +300 degrees Fahrenheit. When connected to the CoCo using the circuit from Part I and that presented this month, you can measure 0 to 255 degrees Fahrenheit. With modifications to the circuit, and some negative voltage, the complete range can be attained.

Well, let's start with the LM34. It comes in two flavors. The first style is a TO-46. This is a small metal can similar to a normal 2N2222 transistor. This metal case is extremely rugged and can be soldered directly to a metal surface or a pipe without damage. This is handy when measuring the temperature of a container such as a pot or a water tank. Just think of the many possible applications.

The other package is a TO-92. This is a small plastic package similar to a 2N3904 transistor. It is more suited to measuring air temperature. You can even make a small probe to measure surface temperatures of such things as skin, a light bulb, or even the parts inside your CoCo. However, care must be taken when working with the plastic part. I'll give you more hints on how to connect it later in this installment.

The LM34 has three pins. The first is ground. This is the reference against which the output signal is measured. Note, however, if you use the TO-46 package, the metal can is also connected to ground. This makes whatever is connected to the TO-46 package grounded with the electronics used (in our case the CoCo). In other words, if you connect the LM34 to a water pipe, the CoCo becomes grounded at that point and at whatever other point the water pipe is grounded. You must be careful when using the metal TO-46 package.

The second pin is the voltage input. This voltage can be from 5 volts to 30 volts DC and is used to power the device. It can use as little as 70 µA (microamps) of current. The maximum output current is 10 mA (milliamps). As applications differ, the LM34 comes in various versions for different temperature ranges. The following is a list of part numbers and their ranges:

Part	Range
LM34, LM34A	-50° F to +300° F
LM34C, LM34CA	-40° F to +230° F
LM34D	+32° F to +212° F

Now the final and most important pin — the output. This device generates an output of 10.0 millivolts per degree Fahrenheit. As you all know, 1 mV is equal to .001 volts. For example, if you have a temperature of 55F the output of this device is 550 mV, or .550 volts. You get this value by multiplying the temperature by 10. The units for the result are millivolts. There is another part named the LM35. This is a brother to the LM34 and does the same thing as the LM34 except that its output is calibrated to match the Celsius temperature scale. All other factors are the same. I mention this since I live in Canada and we practice the metric system. (You know... meters, liters, grams and kilograms.) Imagine, you measure pressure in PSI (pounds per square inch) while we in the great white north measure pressure in Kilo-Pascals. I don't know the ratio of PSI to Kilo-Pascals. Well, anyway, the LM35 is for us.

The LM35 comes in the same packaging and ranges as the LM34. Following are the temperature ranges for the different versions of the LM35:

Part	Range
LM35, LM35A	-55° C to +150° C
LM35C, LM35CA	-40° C to +110° C
LM35D	0° C to +100° C

The output formula for the LM35 is 10.0 mV per degree Celsius.

OK, since we now know how this wonderful device works, let's continue with the theory of how to get the temperature out of all these gizmos. Look at Figure 1 and examine U3, the analog-to-digital converter I described previously. For simplicity's sake I left out the part of the circuit that interfaces to the CoCo. (If you need more details, re-read Part I.) One of the things that makes an A-to-D so versatile is its use of an external voltage reference. Therefore, you can digitize a wide variety of voltages. In this case, because of the lack of negative voltage (more on this later), both the AGND and VI- of the A-to-D are tied to ground.

Tony DiStefano is a well-known early specialist in computer hardware projects. He lives in Laval Ouest, Quebec. Tony's username on Delphi is DISTO.

Connected to VREF of the A-to-D is D1, an LM385-1.2.

As the name implies, the LM385-1.2 is a 1.2-volt voltage reference. This two-pin device has very similar characteristics to a zener diode. When positive voltage is applied to the cathode via a resistor, a constant voltage appears across the diode. Unlike a zener, this voltage reference cannot dissipate much power. The maximum current it can handle is 20 mA. But also unlike a zener, it is much more precise. The actual voltage output of this device is 1.235 volts.

As mentioned last time, the VREF of an ADC0804 is half the voltage required for proper full-scale conversion. On an eight-bit A-to-D, full-scale is the value $FF, or 255 in decimal. This means that half of the voltage you want to be considered full-scale is required at VREF. Confused? Don't be, it's simple. If you want 10 volts to be full-scale, then VREF must be 5 volts. Since we want the final product as simple as possible, I chose to use a scale that gives you 1 degree Fahrenheit per bit. When finished, this means you read that value in degrees directly. If the value you get from reading this device is 10, then it is 10°F. If you read 70, then the temperature is 70°F. A value of 212 indicates whatever your sensor is connected is hot enough to boil water.

Since the voltage output of the LM34 is constant, VREF is the only variable we can use to adjust the full-scale reading. At 10.0 mV per degree, VREF needs to be half of what is required. The ideal value for VREF is 1.275 volts. According to the output formula of the LM34, a full-scale reading of 255 degrees Fahrenheit corresponds to 255 times 10mV, which gives us 2.55 volts. Now, according to the A-to-D, a full-scale reading is given when the input voltage (VI+) is equal to twice the VREF voltage. Combining these two facts gives us the value required for full-scale reading.

$$VREF_{full\ scale} = VI_{output\ at\ 255°F} / 2$$

Substituting values:

$$VREF_{full\ scale} = 2.55 / 2$$

Therefore, $VREF_{full\ scale} = 1.275$

The 1.235 voltage reference given by the LM385-1.2 is about as close as it gets as far as voltage references go. The error is relatively small. If you need a more precise value, use the LM385 adjustable voltage reference. In that case, you need some very precise resistors that are also temperature stable. Replace them for the LM385-1.2 in my circuit. You might also want to change R2 to a lower value. The theory here is that if the voltage regulator has to work harder (sink more current), the voltage drifts a little higher. Remember, though, the maximum current is 20 mA.

Well, this just about covers all the theory aspect of this project. Now for the hard part — putting it together. Again, look at the circuit in Figure 1. All of the parts except the LM34 and C3 mount on the board you started building last time. If you did it right, there should be plenty of room left for this. Normal care in circuit building should be taken when soldering these components to the board.

Now, for the sensor. Some of you might

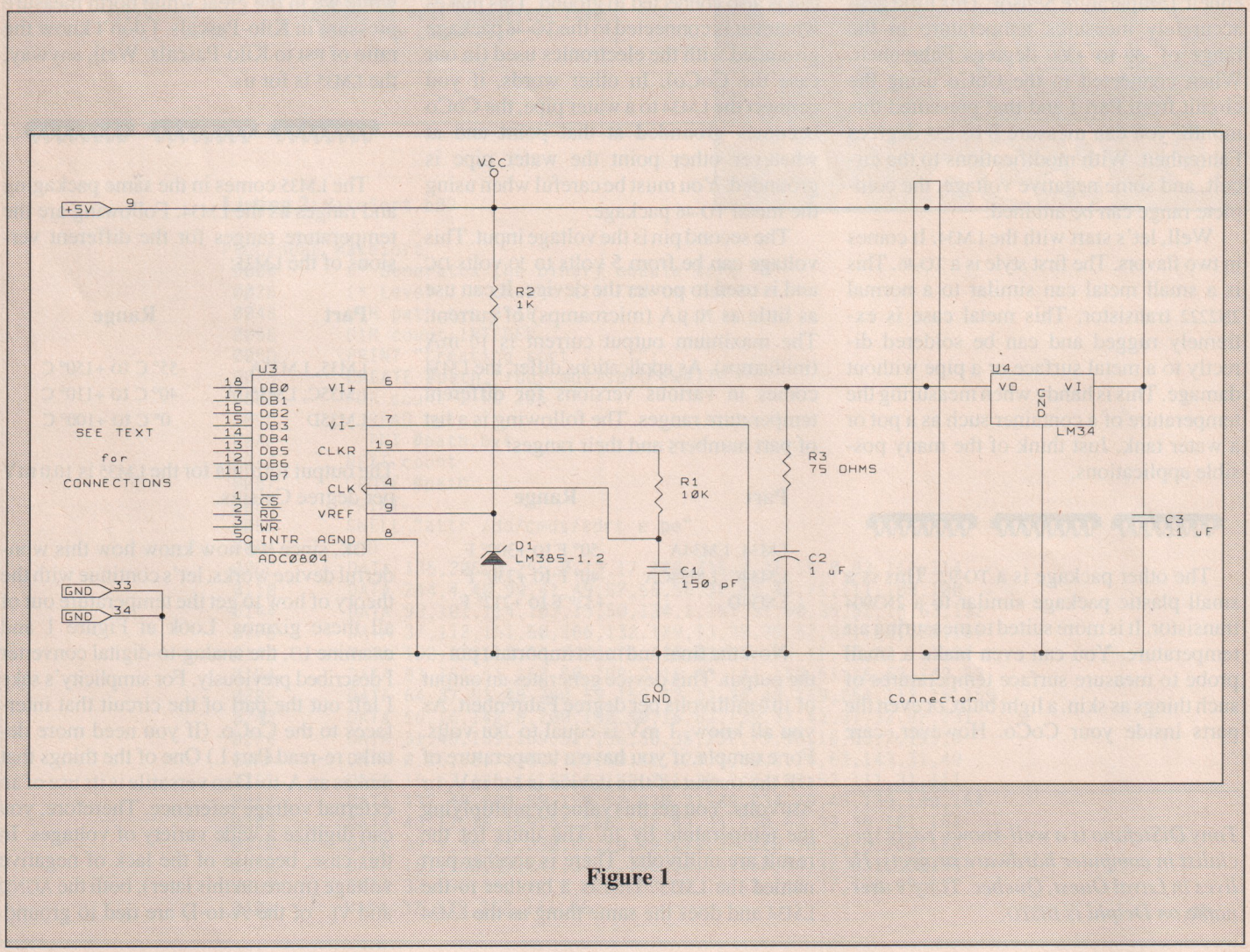


Figure 1

want to skip the connector and mount the sensor right on the board. This is fine if all you want to measure is the temperature of the room you are in. But if you want outside temperature or swimming pool temperature, you must run some wires. And with long wires I suggest you use a connector. The style and size of connector is up to you, but I suggest a three-pin header connector. It is small and does not cost very much. You also need three-conductor cable. The National data manual suggests using shielded wire for long runs, but does not mention the maximum length. Make sure the shield is the ground signal. Capacitor C3 should be physically close to the LM34.

You must pay attention to the sensor itself. In the case of the metal package, the case temperature gives you the correct output, but if you use the plastic package the lead wires are the principal thermal path to carry heat into the device. This results in air temperature being the correct reading rather than the surface of the device. To minimize the difference, cover these wires with a bead of epoxy, which insures the package and wires are all the same temperature. If you plan to run these wires in a hostile environment, make sure you use the proper wiring. As with any IC, the LM34 and accompanying wiring and circuits must be kept insulated and dry to avoid leakage and corrosion. This is especially true if the circuit operates at cold temperatures where condensation can occur. Use a printed-circuit coating or varnish to protect your device. Epoxy paints or dips can also be used. Just take care that no water or chemical reaches the LM34, C3 or their wiring. If grounding is a problem, use either the plastic package or insert the metal package in a small container and fill it with epoxy. Whatever the case, use common sense to wire the LM34 — they last longer.

When connected to the CoCo, the LM34 measures 0 to 255 degrees Fahrenheit.

Finally, when all is wired and checked, install the chips and turn on your computer. Put the sensor in room temperature and check the voltage at Pin 6 of U3. It should be around 0.7 volts. Then enter the following commands:

```
POKE &HFFA8,0
PRINT PEEK(&HFFA8)
```

The first line starts the converter. The second line reads the data and prints it on the screen. The printed result should be around 70. If it is, make a few more tests. If it is not, check your wiring again. Proceed with the regular trouble-shooting routine. If everything is OK, try different temperature sources. Boiling water and ice are usually easily found. Also, check another thermometer for accuracy. Remember, pure water boils at 212°F and pure water freezes at 32°F.

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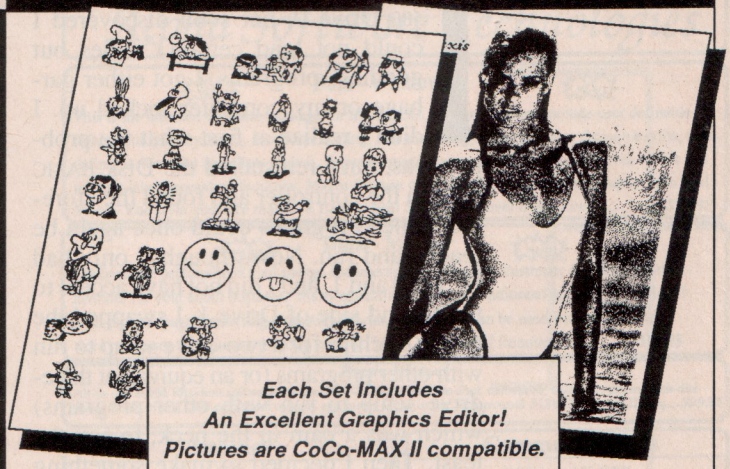

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From one ROM to another

Disk Controller ROM Selector

by Robert C. Merryman

I added a double-sided drive and the Disk ROM supplied with it to my FD-500 Drive 0, but soon discovered I could not load certain "oldies but goodies" programs. I got either garbage or my computer locked up. I didn't realize at first what the problem was, but I reinstalled the Disk BASIC ROM in the controller and found the aforementioned programs could once again be loaded and run. Now, though, I only had Drives 0 and 1, and I did not have access to the second side of Drive 1. I swapped the two ROM chips for a two-drive setup to run with other programs (or an equivalent three-drive setup to run with other programs) which was a pain in the neck, to say the least. Then I decided to make something that would electrically swap the ROM chips to avoid the process of unplugging the controller, opening it, switching chips, closing the controller, and plugging it back into the computer.

Robert Merryman is retired and has an amateur radio operator's license. He has had several construction articles printed in ham magazines. He can be contacted at 8350 E. McKellips #111, Scottsdale, AZ 85257. Please include an SASE when requesting a reply.

My first thought was to piggy-back the two chips, but I concluded the controller housing was not high enough to allow it to then be closed. There just didn't seem to be enough room in the controller housing for another chip. Then I thought of mounting the chips and switch outside the controller housing. I went to Radio Shack, and a couple of other electronic parts stores, but could not find an aluminum case small enough for the project. I did, however, purchase two 24-pin sockets, a 24-pin header connector, two LED indicators, and a DPDT switch. (This ROM switcher is designed for 24-pin ROMs. With appropriate modifications, the same idea can be extended to handle 28-pin ROMs.) I checked my 'junk drawer' and found a plastic box approximately 2-by-3-by-1 with a hinged lid that seemed adequate to hold a piece of perf board containing the two 24-pin sockets, a switch, and the two LEDs.

I cut the perf board to fit into the plastic box and supported it with two pieces of plastic approximately 3/8 inch square by 2 inches long. I fastened these to the inside of the box, at the bottom on each end, with some "goop" cement. Next, I drilled a hole in the back of the box near the left end (with the box facing me; the cover hinge at the rear) large enough for 24 wires to pass

through and low enough to be below the perf board.

To hold the ROMs, I inserted wire-wrap sockets side-by-side in the perf board and bent their pins alternately one way, then the other. This is all that is needed to hold the sockets in place. It also makes the job of soldering easier. Then I drilled holes for the switch and the two LEDs in the left side of the box (facing me when mounted to the controller).

To allow future removal of the perf board, mount the switch on a small bracket cemented to the board with "goop." Size the bracket so the switch handle passes through the hole drilled in the box. The LED indicator cannot pass through holes like the switch can, so use a connector that can be disconnected. I used wire from my scrap drawer, but if I had it to do over again I would purchase a roll of wire with thinner insulation. This makes for easier handling and a less bulky cable.

With the exception of pins 12 and 24 of both sockets and the header, all the pins are connected by numbers. For example, Pin 1 of Socket 1 to Pin 1 of Socket 2; Pin 2 of Socket 1 to Pin 2 of Socket 2; and so on until all pins, except pins 12 and 24, are connected. Use the schematic in Figure 1 (see following page) as a visual aid. In addition, all pins (except 12 and 24) on one of the sockets have an additional wire (approximately 9 inches long) soldered to them. The free ends of these wires pass through the hole in the back of the box. Once the connections are made, clip the excess socket leads close to the soldered connections. Add two extra wires approximately 9 inches long to the wires passing through the hole in the back of the box. These wires will be used later. You can use a small cable clamp to hold the wires in place. Fasten it to the bottom of the perf board with a small machine screw.

The two extra wires just added are now soldered, one each, to the center connections of the DPDT switch. The top and bottom switch connections on one side are fastened by a short piece of wire to Pin 12 on each socket. The other top and bottom switch connections are attached in like manner to Pin 24 on each socket. Carefully check these connections to ensure proper installation.

Next connect the two LEDs by a socket made from a section of an old 24-pin IC socket (cut a 5-pin section). Slip the two end pins and the center pin over the leads from the LEDs. The two positive leads go to each end terminal. The two negative leads are soldered together and go to the center terminal of the homemade socket. The leads must be bent and cut so the socket slips on them.

Connect the two end pins of the LED socket to the switch terminals that connect to Pin 24 on each of the ROM sockets. The center pin of the LED socket is connected to one end of a 470-ohm resistor (1/4 watt is fine). The other end of the resistor is connected to the center terminal of the switch on the side having the top and bottom terminals connected to Pin 12 on both ROM sockets.

Fasten the box to the top cover of the controller. Drill two small holes through the cover from the bottom side and into the bottom of the plastic box. Use two 4-40 self-tapping machine screws, or equivalent, to fasten the box to the controller cover. I placed 1/4-inch, self-sticking felt cushions to the bottom of the plastic box (one at each corner and one next to each screw hole), although it wasn't necessary.

To get the 24 wires into the controller, first loosely place the cover on the controller without snapping it shut. Sight approximately where the back of the ROM in the controller is located. Mark the side of the cover between that point and where the cable comes out, and down from the hole in the plastic box. With a round file, carefully

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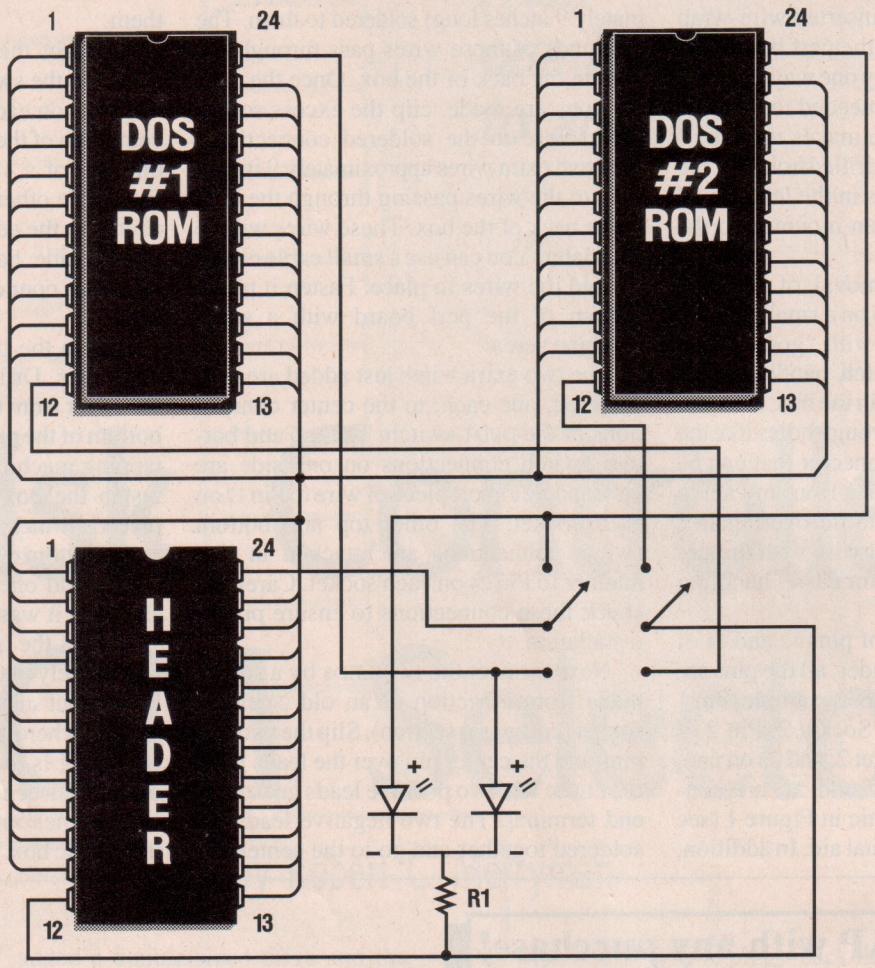

Figure 1

make an opening (half on the cover and half on the base) so that when the controller cover is tightly closed there is a hole large enough to accomodate the 24 wires. Slide a small piece of tubing over the wires to the position where the wires pass into a case. Finally, plug the header into the controller ROM socket. Make sure that Pin 1 is plugged into Pin 1 of the socket.

Now comes the tricky part of cutting and soldering the 24 cable wires to the proper pins on the header. With the aid of an ohmmeter, find the wire connected to Pin 1 of the sockets in the plastic box. This is easier if the wires are color coded. If the wires are not color coded, strip the insulation from each wire (about 1/8 inch) and with the meter probe touching Pin 1 of the sockets, touch the bare ends of the wires with the other meter probe until there is an indication (the ohmmeter needle goes to zero) that the wire is connected to the pin the probe is touching. Solder this wire to the same pin number on the header. (At this point, I removed the header and held it with a small vise on the bench. This made it easier to work with and eliminated the possibility of heat damage to the controller board.) Proceed with the next pin number in the same way until all pins (except pins 12 and 24) on the header have their respective wires soldered. Proceed down the line from Pin 1 to Pin 11, leaving a bit of slack so that the wires can be dressed neatly when completed. (Pins 13 and 23 can have their wires cut shorter.) When ready for pins 12 and 24, find the wire by using the ohmmeter in the same way as described previously. This time, however, touch the probe to the center connection of the switch on the side where the upper and lower connections go to Pins 24 on the sockets and the other probe touches one of the remaining wires to get a "zero" reading. Solder that wire to Pin 24 on the header. Solder the remaining wire, if everything is correct, to Pin 12 of the header. Use the ohmmeter probe and touch the center connection of the switch on the side where the upper and lower connections go to Pin 12 on the sockets. The meter should reach a "zero" reading and the wire can be soldered to the header.

Carefully reinspect the solder joints to make sure they are all good. Wrap a piece of tape around the cable near the header as well as where the cable enters the controller case. This process keeps the wires together.

If everything passes visual inspection, install the header in the controller ROM socket with the wires that pass through the hole in the side of the controller. Lower the top in place, snap it shut, and fasten it with its screw.

Plug the disk drive cable into the controller, plug the controller into the computer, and turn the system on. If one of the LED indicators' light and the sign-on message appear, turn the computer off, flip the selector switch, and, after a 15-second delay, turn the computer on. The second LED should light and a different sign-on message appear on the screen. I don't know if there is any harm in flipping the switch with the power on, but I prefer not to take the chance.

That's all there is to it. You can now enjoy two alternate Disk ROMs with your CoCo system.

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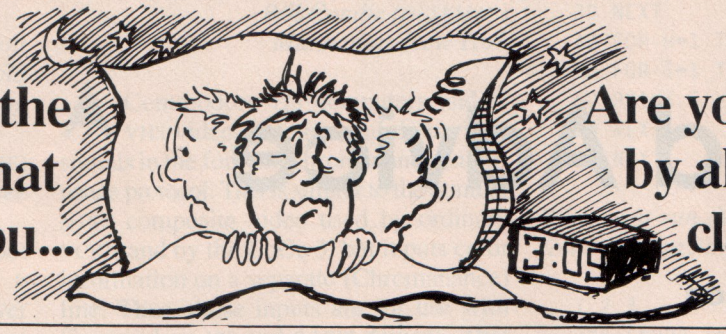

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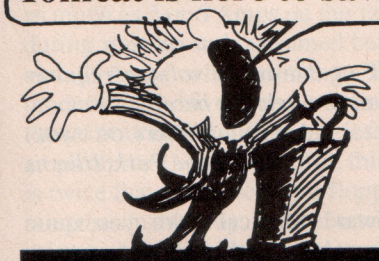

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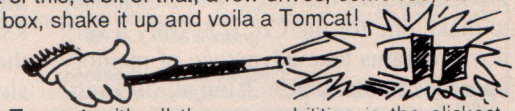

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Sound Advice

by Marty Goodman
Contributing Editor

Q Can I program elaborate sound using BASIC? What happened to the 128K and 256K upgrade boards for the CoCo 1 and 2?

Jonathan Mack
Huntington Beach, California

A BASIC does not provide for sound production beyond a single note of constant volume. To make the CoCo produce two- and three-note chords and vary the volume requires sophisticated assembly-language programming. Each note's waveform must be calculated and output thousands of times per second to a digital-to-analog converter. There is no complex sound chip in the CoCo to produce multivoice music via simple commands. There are many commerical music programs that provide for composing music on the CoCo.

It costs about as much to make an upgrade board for the CoCo 1 or 2 as it does to make one for the CoCo 3. Only a very few programs take advantage of memory upgrades for the CoCo 2, but all OS-9 software and many Disk BASIC programs are set up to take advantage of extra memory on the CoCo 3. The cost of a CoCo 3 is around $100. With all the many other improvements the CoCo 3 offers over the CoCo 1 and 2, CoCo users wanting more power moved up to the CoCo 3 with its standardized and well-supported memory upgrade rather than wasting money on an upgrade for a less-capable computer. Thus, the market for CoCo 1 and 2 memory upgrades beyond 64K evaporated and manufacturers withdrew these products.

Martin H. Goodman, M.D., a physician trained in anesthesiology, is a longtime electronics tinkerer and outspoken commentator — sort of the Howard Cosell of the CoCo world. On Delphi, Marty is the SIGop of RAINBOW's CoCo SIG and database manager of OS-9 Online. His non-computer passions include running, mountaineering and outdoor photography. Marty lives in San Pablo, California.

The SmartWatch Connection

Q Can I use my SmartWatch in the 24-pin ROM socket of my RS-232 Pak? I find that, when in the disk controller card with the disk ROM piggybacked on it, I have trouble closing my controller case and had to cut a hole in it.

Mike Passer (MPASSER)
Groton, Connecticut

A The two problems you encounter are those of getting 5 volts to the 28-pin SmartWatch from the 24-pin socket in the RS-232 Pak and making sure the software that addresses the SmartWatch knows what slot the RS-232 Pak is in (if you are using a Multi-Pak Interface) so it can find the SmartWatch. Art Flexser tells me that *Extended ADOS* has provisions for looking for the SmartWatch in other Multi-Pak slots and that all you need to modify the SmartWatch for use in a 24-pin socket is to put a jumper between pins 28 and 26, then plug it in the 24-pin socket so that pins 1, 2, 27 and 28 overhang the socket.

Slot-Pak III and RS-232

Q I just bought a Slot Pak III from Howard Medical and wanted to purchase an RS-232 Pak to use with it. Howard Medical told me only the old (now discontinued) Tandy RS-232 Pak would work in the Slot Pak III. Specifically, I was told that the Disto RS-232 Pak will not work in the Slot Pack III due to its voltage requirements. Can you help me here?

Joe Aniolowski (JOEANIOL)
LaGrange Park, Illinois

A Howard Medical gave you quite correct information. Here is more information that might help. RS-232 packs need a means of producing RS-232 +12- and -12-volt signal levels. The Tandy RS-232 Pak uses a standard 1488 level-converter chip for this purpose, as does the Disto RS-232 pack. This chip accepts +12 volts on Pin 14 and -12 volts on Pin 1. However, the Tandy unit gets the +12 and -12 volts needed to power that chip from a solid state ASTEC-brand voltage converter that accepts as an input a single +5-volt line and outputs both +12 and -12 volts. The Disto stand-alone RS-232 pack uses the same 1488 level-converter chip, but powers that chip off the +12 and -12 volts supplied by a Tandy Multi-Pak from pins 1 and 2 of the 40-pin socket of the Multi-Pak. Now, the Slot Pak III supplies the required +12 volts on Pin 2, but does not supply -12 volts on Pin 1. Therefore, the 1488 level-converter in the Disto RS-232 pack does not work. Now that you know exactly what the problem is, there are many ways to correct it. The quickest way is to buy a second 12-volt DC wall transformer and hook the positive side of its output to Ground in the Disto pack and hook the negative side of its output to Pin 1 of the 1488 chip. The Disto RS-232 pack will then work with the Slot Pak III and a CoCo 2 or 3. Make sure that Pin 1 of the 40-pin bus connector on your CoCo is not connected to anything and not grounded (as it may be on some CoCo 2s)! Other, more elaborate, solutions involve adding either an ASTEC voltage-converter module to the Disto pack or replacing the 1488 chip with one or two MAX232

chips, a more-modern, and more-expensive, level-converter chip with an internal converter that accepts +5 volts and supplies +10 and -10 volts to its level converters.

Where's the Beef

Is there any way to beef up the 5-volt regulated power supply of an old gray case CoCo drive to the point of having it sufficient to run a hard drive?

Lonnie McClure (LMCCLURE)
Chattanooga, Tennessee

A Floppy drives typically draw about .3 Amps on the 5-volt line and .6 Amps on the 12-volt line of their power supply. Some recent 3½-inch floppy drives run exclusively off the 5-volt line. The first (full-height) hard drives made for PC's drew as much as 5 or 6 Amps on the 12-volt line during start-up and consumed between 1.5 and 2 Amps while running. The most modern hard drives consume less than .6 Amps on the 5-volt line and less than 1.2 amps on the 12-volt line. Still, this amount is twice that consumed by a floppy. There is no reasonable way, short of total replacement, to beef up either the +5 or +12 line of the old gray-case CoCo drive setups. The transformer in that case can supply only so much power.

Color Monitors and VCRs

I have an Amdek Color 300 monitor I plan to hook to a VCR and I would like to know the signficance of its Chromanance and Luminance video inputs.

Bill Condie (DESKMAN)
Manhattan, New York

A Commodore 128 computers and S-VHS video systems send their video signals in the form of Chromanance/Luminance protocol. This is similar to the familiar NTSC composite video used by ordinary VCR's and by the CoCo 3, but it puts color information on a separate (Chromanance) line. Thus, those inputs are for use with Commodore 128 and S-VHS devices. That monitor should also have a normal NTSC, or composite, video input or it can be switchable to accept NTSC video on the Luminance line. Alternately, try feeding normal composite video into both the Chromanance and Luminance inputs. This might produce a decent color picture.

Mysterious ?NF Errors

A *Jim Bennett of Poughkeepsie, New York, asked me about a mysterious ?NF error he got in a program he had written. I disassembled the BASIC interpreter in the CoCo and found what was going on. Take as an example the following program:*

```
10 FOR I=1 TO 10
20 IF I=6 THEN 40
30 NEXT
40 FOR H=1 TO 5
50 FOR I=1 TO 3
60 PRINT I
70 NEXT
80 NEXT
```

When you run this program, you get the following puzzling results:

```
1 2 3
?NF ERROR IN 80
```

Here is what's going on. BASIC's algorithm for executing FOR/NEXT loops provides that, when a loop is complete, the parameters for the just completed loop as well as any more-recently defined loops can be dumped from the stack. This is fine, but another aspect of the algorithm is that when a FOR statement is encountered, the stack is checked to see if an entry for that loop variable already exists, which might be the case if there was an earlier defined loop involving that variable that was never completed. If the variable is not on the

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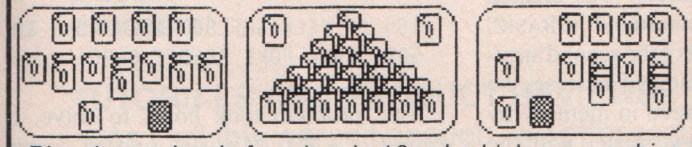

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stack, a new stack entry containing the loop parameters is created. But, if the loop containing the variable does not exist on the stack, the old loop parameters for that variable are simply updated. This is where the problem lies.

In the above example, the entry for the I *loop defined in Line 10 is updated when the second* I *loop is encountered in Line 50, since the first loop did not run to completion. However, when the second* I *loop has run to completion, printing* 1 2 3, *not only the* I *loop information but also the* H *loop information is dumped from the stack, since the* H *loop is erroneously considered more recently defined than the* I *loop (based on the existence of the earlier* I *loop). So when the program gets to Line 80, the* ?NF *error occurs.*

This problem is not unique to the CoCo, but exists in a number of BASIC implementations by Microsoft that use the same FOR/NEXT *algorithm.*

Art Flexser (Author of ADOS)

Building Y Cables

Q *I have some Kell Am 40-pin male IDC edge-card connectors, but none of the corresponding Kell Am row-reversing, female edge-card connectors. I was determined to make a Y cable, so I frayed my 40-pin ribbon cable into 20 pair of wires, putting a half twist in each pair before crimping it to the Kell Am male. The result was row reversal. This procedure was tedious, but took no more than about 15 minutes. The same procedure can connect two 40-pin female edge-connectors to each other so a straight through male-to-male connector (PC board with 20 traces on each side) makes the Y-cable effect.*

Steve Robinson (ROBINSSB)
Bear, Delaware

A You *were* determined to make that Y cable! For what it is worth, Disto at one time had a 40-pin, row-reversing male-to-male edge-card PC board that just plugged into a 40-pin female edge-connector to turn it into a 40-pin male that could be used with other standard 40-pin female edge-connectors to make Y cables.

Screen-Saving Headaches

Q *How can I save a menu that appears on my screen in the middle of some machine-language program?*

Merle Miller
Albuquerque, New Mexico

A You need to stop the machine with the Reset button and hope the program does not attempt to wipe itself out. Then, you need to write a simple assembly-language program to scan through all of the CoCo 3's memory looking for the memory with the image of that screen. When you get it, arrange to print that memory to your printer. This all requires a little programming ability. Note that you could write the scanner program in BASIC, but it would run a little slower. You would need to know how the GIME display and memory management registers work. This information is in the Tandy Service Manual for the CoCo 3.

Saving PMODE 4 Pictures

Q *How can I save to disk a* PMODE 4 *(Hi-Res CoCo 1/2-type) screen? Is it normal that I can no longer use the disk drive when I move the slot selector switch from Slot 4 on my catalog #24-3024 Multi-Pak Interface?*

Walter Myers (WALTM)
Chicago

A To save out a PMODE 4 screen, you need to know where it is located in the computer's memory. Most PMODE 4 screens generated by BASIC programs are located at addresses $0E00 through $25FF (Hex notation here). You could save such a screen to disk using the command

```
SAVEM"FILENAME.EXT",&H0E00,&H25F
F,&HA027
```

This assumes the screen was created using the PMODE 4,1 command in BASIC. Each number increment of the second argument of the PMODE 4 command increases the start of the PMODE 4 screen in memory by $600. Therefore, an image created with the PMODE 4,4 screen would exist at addresses $2600 through $3DFF, [$0E00 + (4 X $600) = $2600] and have to be saved using

```
SAVEM"FILENAME.EXT",&H2600,&H35F
F,&HA027
```

The last address is an unused execution address. I used $A027 as that is BASIC's "restart" address, and accidental execution of such screens don't cause a crash.

Mac Sound with *ADOS*

Q *I have a problem with* PLAYMACS.BAS *not working with* ADOS3. *Can you help me?*

Dennis McMillian (COCOKIWI)
Pittsburgh, California

A According to Art Flexser, PLAYMACS.BAS was written by Chris Babcock, who consistently uses the very ill-advised technique of checking the BASIC ROM revision number by looking for the D at the beginning of the Disk Extended Color BASIC message. Naturally, this D is not present in most customized *ADOS* sign-on messages. The fix for PLAYMACS.BAS is to add the following line:

```
135 POKE &HFB5D,&H42:POKE &HFB5F
,&H30
```

While you are at it, you might want to force the uppercase mode by adding a POKE &H11A,255. There appears to be a bug in the Merge function in this program.

For reference, a far better way to check the BASIC Disk ROM revision number is to look for the revision number itself in the sign-on message, since *ADOS* users are instructed to preserve that number in exactly the same place as it is in Disk BASIC. Note that *ADOS* is basically an enhanced Disk Extended Basic 1.0.

Art Flexser recommends that *Extended ADOS3* users having trouble booting *CoCo Max III*, versions 3.1 and 3.5, use the following fix:

In BOOT.BAS in Version 3.1, add the following line:

```
165 IF PEEK(&HFE80) THEN POKE &H
5DE6,&HA4:POKE &H5DEF,&H80
```

In both BOOT.BAS and BOOTRS.BAS in Version 3.5, add this line:

```
165 IF PEEK(&HFE80) THEN POKE &H
5DE9,&HA4:POKE &H5DF2,&H80
```

This problem took hours to solve. It seems *CoCo Max III* expects (indeed, counts on) an 8K-size Disk ROM as well as it ghosting — an ideosyncrasy of the way the CoCo ROM socket is wired. When you use a 27128 (16K-by-8) *Extended ADOS 3* EPROM, *CoCo Max III* gets confused and unhappy. But the above fix straightens things out.

Your technical questions are welcomed. Please address them to CoCo Consultations, THE RAINBOW, P. O. Box 385, Prospect, KY 40059.

We reserve the right to publish only questions of general interest and to edit for brevity and clarity. Due to the large volume of mail we receive, we are unable to answer letters individually.

Questions can also be sent to Marty through the Delphi CoCo SIG. From the CoCo SIG> prompt, pick Rainbow Magazine Services. Then at the RAINBOW> prompt, type ASK (for Ask the Experts) to arrive at the EXPERTS> prompt, where you can select the "CoCo Consultations" online form, which has complete instructions.

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Novices Niche

Ohm's Law
by Loy Milam

A high percentage of the people who own personal computers also have an active interest in the field of electronics. If you are in this group, you'll find *Ohm's Law* a handy tool for both textbook studies and the workbench.

Ohm's Law, formulated in 1826 by George Simon Ohm, is a group of mathematical formulas dealing with the basic relationships between voltage, current, resistance and power. The basic relationships are

$$E = I \times R$$

and

$$P = E \times I = I^2 \times R$$

where E is the voltage across the circuit, I is the current through the circuit, R is the resistance and P is the power dissipation. These formulas are used to calculate the flow and effect of electricity in electronic circuits. *Ohm's Law* greatly simplifies these calculations.

The program is arranged in a simple menu format and is very user-friendly. You enter two known variables and the program uses them to calculate the two unknown variables. To get started, load the program, type RUN and press ENTER. Select the proper number from the menu depending on which two variables are known. Press 1 if the voltage and current are known, press 2 if the voltage and resistance are known, and so on. Enter the appropriate values when prompted by the program. Finally *Ohm's Law* displays the voltage, current, resistance and power.

For reference, here are some sample problems, including the calculated answers:

Problem 1: The voltage and resistance are known. (Press 2)

Voltage = 42.8 volts (Enter 42.8)
Resistance = 16,000 ohms (Enter 16000)

Displayed answer:
Voltage = 42.8 volts

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Resistance = 10 ohms (Enter 10)

Displayed answer:
Voltage = 7.32 volts
Current = .732 amps
Resistance = 10 ohms
Power = 5.35824 watts

The computer prints very large or small numbers in exponential notation (2.675E-03 in Problem 1). The E-03 simply means the decimal point is to be moved three places to the left (2.675E-03 is equal to .002675). If the notation had read E+03, the decimal point should be moved three places to the right. For additional information on exponential notation see E-Notation in your manual.

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```
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2 'WRITTEN BY LOY MILAM
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10 CLS:PRINT"     OHMS LAW CALCU
LATIONS":PRINT
15 PRINT"1 VOLTAGE AND CURRENT K
NOWN"
20 PRINT"2 VOLTAGE AND RESISTANC
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25 PRINT"3 VOLTAGE AND POWER KNO
WN"
30 PRINT"4 CURRENT AND RESISTANC
E KNOWN"
35 PRINT"5 CURRENT AND POWER KNO
WN"
40 PRINT"6 RESISTANCE AND POWER
KNOWN"
41 PRINT:PRINT:PRINT:PRINT:PRINT
"       INPUT NUMBER (1-6)
        FOR PROPER EQUATION"
42 INPUT X
45 IF X=1 THEN GOTO 75
50 IF X=2 THEN GOTO 110
55 IF X=3 THEN GOTO 145
60 IF X=4 THEN GOTO 180
65 IF X=5 THEN GOTO 215
70 IF X=6 THEN GOTO 250
75 CLS:INPUT "INPUT VOLTAGE";E
85 INPUT"INPUT CURRENT";I
95 R=E/I
100 P=I*E
105 GOTO 290
110 CLS:INPUT "INPUT VOLTAGE";E
120 INPUT "INPUT RESISTANCE";R
130 I=E/R
135 P=(E^2)/R
140 GOTO 290
145 CLS:INPUT "INPUT VOLTAGE";E
155 INPUT "INPUT POWER";P
165 I=P/E
170 R=(E^2)/P
175 GOTO 290
180 CLS:INPUT "INPUT CURRENT";I
190 INPUT "INPUT RESISTANCE";R
200 E=I*R
205 P=(I^2)*R
210 GOTO 290
215 CLS:INPUT "INPUT CURRENT";I
225 INPUT "INPUT POWER";P
235 E=P/I
240 R=P/(I^2)
245 GOTO 290
250 CLS:INPUT "INPUT RESISTANCE"
;R
260 INPUT "INPUT POWER";P
270 E=SQR (P*R)
275 I=SQR (P/R)
280 GOTO 290
290 CLS:PRINT:PRINT:PRINT"   VOL
TAGE=";E; "VOLTS"
295 PRINT"   CURRENT=";I; "AMPS"
300 PRINT"   RESISTANCE=";R; "OH
MS"
305 PRINT"   POWER=";P; "WATTS"
310 PRINT @ 384,"(1) ANOTHER CAL
CULATION         (2) END PROGRAM
"
311 INPUT Y
315 IF Y=1 THEN GOTO 5
320 IF Y=2 THEN END
```


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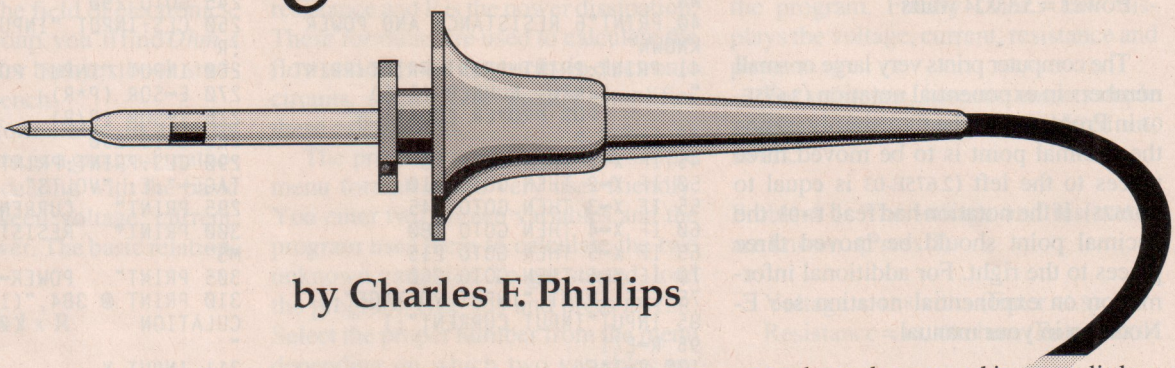
Soldering Fundamentals



by Charles F. Phillips

Many people are afraid to tackle some of the fine hardware projects seen every month in THE RAINBOW or attempt repairs because they aren't familiar with soldering procedures. Good soldering is really very easy and, as long as proper attention is paid to the fundamentals, anyone can do it. You might notice that I added a catch in my last sentence. It's absolutely true that it's easy, but there are several small shops that pay their rent repairing the repairs made by people who neglect the fundamentals.

This article is intended to impart the fundamentals of soldering, thereby enabling the beginner to successfully make common repairs and construct various projects. There have been volumes written about soldering, but I haven't the space to cover all its many facets. Also, keep in mind that there are many ways to skin a cat (sorry, CoCo Cat) and my way is by no means the only way. There are certain requirements to get the job done right, but don't worry, I'll let you know when I'm standing on my soapbox. In any case, by the end of this article you should be able to remove and replace component parts, prepare homemade circuit boards for use and know a couple of methods of board repair.

Charles F. Phillips is a staff sargeant in the U.S. Marine Corps, and works as a radar technician. He specializes in long-range, three-dimensional air surveillance radar systems. Charles is married and has two sons. He may be contacted at 677 Camelia Drive, Laurel Bay, SC 29902, (803) 846-8762. Please include an SASE when requesting a reply.

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Table 1: Soldering Supplies

The little lines you see going all over a circuit board are referred to as *runs*. Runs usually connect to *pads*. Pads are usually round with a hole in the center for component leads to pass through and be soldered to, but these can be any shape and may not have a hole. Although you won't see it very often, there are times when an engineer has a reason for attaching components flat to the board. *Flat-packs*, or computer chips as they are now commonly known, used to be attached in this manner. Also, edge connectors are nothing more than a series of rectangular pads arranged in a neat little row.

Large plated areas having runs connected here and there are referred to as *ground planes*. These can be held at chassis ground, earth ground or any other system reference. The negative side of the power supply is most commonly used as chassis ground, but never assume that the ground plane is at zero potential to you or the equipment around you. I have a transmitter-grid pulser unit in my radar whose chassis ground is at 14,000 volts in respect to the rest of the radar. Touch that one and you're assured to have a pretty bad day.

There are three basic types of boards. First, the single-layer, single-sided boards have all the runs on one side of the board and usually have all the components mounted on one side (either side). If you construct a project using Radio Shack's circuit board kit, this is the type you make.

Single-layer, double-sided boards have runs on both sides of the board and usually have all the components mounted on one side. These are the most common these days, and the CoCo is built on this type of board. The holes in the pads are usually plated through so that runs can connect on both sides.

Multilayer boards are exactly what the name implies. They not only have runs on both sides, but also between layers. These are a real bear to repair, but thankfully not very common. As the new square micro circuits with more legs than a caterpillar become more common, we may see a lot more multilayer boards.

Tools of the Trade

The list of supplies for quality soldering work is not very long or expensive, unless you want it to be. Table 1 is a list of the materials I use and consider necessary, but it is nowhere near all the possible equipment. For those whose needs exceed those of the hobbyist, or if you simply like spending money, there are soldering stations available from companies such as Pace, Inc., that provide variable heat control, reversible-power vacuum desoldering tools and more . Following is a quick description of the items in Table 1 and things to look for in these items.

The soldering iron must have the ability to operate at different heat ranges and use different shaped tips. Small work on printed circuit boards is generally performed with a pointed tip at 600 degrees. Desoldering and larger work is generally performed with a spade tip at 700-800 degrees. A soldering stand for the iron can be purchased, or constructed out of hanger wire as long as it is steady and does not contact the tip or heating element, thereby sinking heat and shortening the life of the element. A wet sponge is kept at hand to remove the oxidation build-up on the iron by quickly pressing each side of the iron's tip into the sponge immediately before each application of heat. This is absolutely essential and usually overlooked by the hobbyist.

Flux-core solder should always be used. Solid solder is used for certain applications in micro-miniature soldering, but is way beyond the scope of this article.

Flux is another item generally overlooked by the hobbyist, but cannot be stressed enough (I'm standing on my soapbox, screaming at the top of my lungs). The flux contained in flux-core solder is only enough to ensure that the solder itself does not oxidize when heated. Additional flux is required to keep the surfaces being soldered from oxidizing and also to ensure proper heat transfer over the entire surface being soldered. I prefer liquid flux because I feel it provides better heat transfer, but many people prefer paste flux since it's easier to find and creates less of a mess to clean when finished. Whether you decide on liquid or paste, be sure that you purchase the brown electronics flux (which is made from pine sap) because the type used for soldering waterpipes and other large jobs contains corrosive cleaning agents that can, in time, ruin very expensive circuit boards. Also, thoroughly scrub your hands after you're done because ingestion of even the tiniest amount of pine-based flux will cause a galloping case of the trots.

Solder suckers of both the bulb type and the plunger type are not necessary items, but prove useful during desoldering when removing large amounts of solder and especially useful when removing solder from holes in the circuit board. Both types, however, are rather clumsy (at least in my hands) and often don't completely clean a pad of excess solder. This is where wicking braid enters the picture. Although more tedious, wicking braid can do everything solder suckers can and will do a very clean job of removing all excess solder. This is nothing more than a copper (sometimes steel) braid placed between the iron and the area to be cleaned. Its function is to soak up the melting solder.

Cleaning surfaces that are to be soldered is an absolute must (climbing back on my soapbox now). Not doing it properly is almost always the cause of the so-called cold solder joint. Flux is capable of cleaning oxidation only as it occurs during the heating process. Pre-existing oxidation, dirt and even the oil from your skin, will mess you up. The eraser is used to remove visible oxidation and the surface should be shining when you stop. Once the parts are in place for soldering, complete the cleaning with cotton swabs and alcohol. If you have to touch the parts to readjust them before

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soldering, again hit them with alcohol. The toothbrush and alcohol are used to clean flux residue after soldering. This is important because flux attracts dust that will eventually prevent your circuitry from properly dissipating heat.

Flush-cutting pliers provide a clean cut when trimming leads to length. Actually, any fine set of dikes will work; a clean, flush cut simply shows professionalism. Smooth jaw needlenose pliers usually have a fairly sharp edge around the jaw and should be smoothed off with a fine sharpening stone. This will prevent scoring the leads of a component, which allows an intrusion of corrosion. Also, in super-high-frequency circuitry, such as I work with, it can change timing by altering the interelectrode inductance and capacitance. Not very relevant to the CoCo 3, but who knows how fast the CoCo 7, the MM/10 or the TC-25 will run? Soldering aids vary, but they usually are double-ended with a curved spade tip on one end and a two-prong fork on the other. This is used to bend and otherwise manipulate component leads. Not truly necessary, but once you have one, you'll wonder why you never did before.

Hemostats are useful in two ways. First, they are excellent for holding parts in place for soldering. Second (and far more important) they make perfect heatsinks to prevent killing your components before you ever even apply power to them. They should be small and you should stone the sharp edges off the jaws and teeth.

As I pointed out earlier, this list of supplies is by no means all-encompassing, but will provide the basic requirements for removal and replacement of components as well as some limited board repair. Next I'll cover removal, replacement and repair.

Getting Down to Business

The keys to quality work are like anything else — you must pay attention to the fundamentals and practice, practice, practice. I've been soldering for years and I practice before each job. If you pick up a junk board and practice until you have it right, the final product shows it.

There are two basic types of component removal: destructive and nondestructive. Destructive removal means that a chip, or any other component, is removed by clipping the leads off the body and then quickly heating the solder joints individually to remove the remainder of the lead and the solder. Nondestructive removal means that you remove the solder from each lead of a component without clipping and harming the chip or pads on the board with excessive heat.

Nondestructive removal requires more training and experience than destructive removal. Nondestructive removal is generally avoided by those of us with years of experience because the possibility of board damage is of greater concern than saving a ten dollar chip whether or not it still works. For this reason I'm only covering destructive removal.

Start by clipping the leads as close to the body of the chip as possible. This will leave plenty of lead to grab with your needlenose pliers. Heat your iron with a 700 degree spade tip. If this is the first time you've used it, melt some solder on it up to about ½ inch. This prevents the tip from corroding and producing poor results. Double fold a paper towel a couple of times to wipe the excess solder off the tip. Smear a little flux on the solder joint and get a grip on the exposed part of the lead with your pliers. Always remember, just before applying heat to the workpiece, press each side of the tip quickly into a wet sponge to remove corrosion that accumulates on an idle hot iron. Press the tip into the solder joint at about a 45 degree angle. As soon as the tip bottoms out in the joint, the solder liquifies and the lead should pull right out. Get the tip out of there as soon as the lead is free because overheating is almost always the cause of pads lifting off the board. Go ahead and pull all the leads and worry about removing the solder on the next pass.

Occasionally, a lead does not pull out as simply as I've just described. This could be caused by the lead having been bent to hold the component in place for soldering or it could simply be a tight hole. In either case you can reapply heat and bend the lead or work it out as necessary. However, at no time should you apply heat for longer than three seconds. Just let it cool for a while and then work on it some more. I realize three seconds sounds very short, but it's necessary to prevent board damage. If you've been practicing as I suggested, a lot can be accomplished in three long seconds.

Now that all the leads are removed, clean the flux and other dirt off with alcohol and a toothbrush then let it dry. If you prefer to use a solder sucker, heat the solder and vacuum it up with the iron in place. Even though it takes about a second for it to harden, solder gels the instant the iron is removed.

As I mentioned earlier, I prefer wicking braid. All you have to do is apply a little flux to both sides of a short stretch of braid, place the braid on top of the solder and place the tip on top of the braid. As the solder heats, you'll feel the braid and iron start to sink. Now simply start to rotate the braid and tip. As soon as you hear it start to squeak, the pad is clean. This method requires just a little practice, but once you've got it down pat you'll find it removes all excess solder while leaving the pad properly "tinned" (I'll cover tinning shortly).

Remove all flux from the board. You're now ready to prepare for installation of the new components.

Always, unless physically impossible, replace a chip with a socket! This prevents heat damage to the new chip and eases subsequent replacement. If you are unable to use a socket, the following directions still apply, but you must also attach a heatsink to the lead being soldered, between the solder joint and the body of the component. I use hemostats, but you can buy specially made heatsinks with filed and smooth jaws. Use alligator clips only as a last resort.

Also, electrostatic discharge (ESD) precautions must be used with a large portion of today's circuit boards and components (including the CoCo). ESD precautions are beyond the scope of this article, but I feel safety should be mentioned. Never connect yourself directly to ground! A 250 megohm resistor should be placed in series between the wriststrap and ground. These 250 megohms pass the static electricity with ease, yet limit any real current. Avoid personal injury — never allow yourself to become the path of least resistance.

Soldering should not be thought of as using a conductive glue. The term *wetting* refers to the actual molecular blending of the solder with the pad and component lead. A *cold solder joint* is one where wetting has not occurred. Although improper cleaning is usually the cause, one method to assist proper wetting is the practice of *tinning*. This is simply the application of a thin coat of solder to the leads and pads before soldering the joint together.

If you are replacing a component, you should only be concerned with tinning the new leads since the pads were already tinned when you desoldered the pad. Clean the component leads, then set the iron on the table with a weight on the tail to keep the iron from rolling around. Now slowly feed solder down onto the tip with one hand while passing the component lead through the molten solder with the other. There should be a very thin coat of solder on the lead. That's all there is to it.

If you are constructing a project board, first wash it in soapy water and rinse it off to completely remove the etchant. Next, go over the runs and pads with an eraser followed by cotton swabs and alcohol. To tin the runs and pads, apply flux all over and drag the spade tip (held nearly flat) down the runs and pads while feeding solder under the tip. Clean off the flux and then remove the excess from the pads with wicking braid. The pads are now properly tinned and the slightly thicker coat on the

runs prevents the copper underneath from corroding. The solder corrodes, but more slowly and can be easily replaced while the copper run cannot be so easily replaced. You can spray polyurethane on the solder side of the board after all the components are mounted to slow corrosion.

Component leads for anything other than chips and sockets should be bent and trimmed to length just as the original component's leads were. Although you'll see it all the time, no component should be mounted with the body in contact with the board (sockets are an exception). A little space between them allows the legs to act as shock absorbers, thus preventing the body from cracking during whatever transit they may be subjected to. Place a paper match or toothpicks between the component and the board to provide this shock space. Clean the board and leads as I've described before and hold the component in place with a rubber band or in some similar fashion to keep the component from moving around. Place a heatsink between the component body and the board.

Once the component is in place, clean the lead and pad once more with alcohol and let it dry. Liberally apply flux to the joint. Cleanliness and the use of flux cannot be overstressed because skipping one or the other is nearly always the cause of a bad solder joint.

Place the tip of the iron at a 45-degree angle into the joint so it is contacting both the lead and the pad. Now feed the solder in so it touches the pad, lead and tip all at the same time. As soon as the solder starts to flow, feed it around the lead until it gets back to the tip again. Depending on the size of the joint, this should take less than a full second. Pull the solder out of the joint and then pull the tip out without moving anything. The whole process should take less than three seconds.

The joint should be nice and shiny. A joint that has been overheated is dull and spotty looking and referred to as *measled*. It is a weak joint and should be redone. A joint that was underheated from not using enough flux to transfer heat looks dull and the result is a weak joint. However, an underheated joint can be cleaned, fluxed and reheated.

The proper amount of solder flows all the way to the edge of the pad and up the lead in a concave manner. If the joint is convex, it is weak and should be redone. If there is too little solder, clean it, flux it and add some more.

Save all the excess length of lead that was trimmed off because this proves valuable in board repair and board design. For board design, if you have two runs that must cross each other to get to their destinations, you can have one run stop on both sides of the other run with a pad/hole on the two ends and use a lead to form a bridge over the other run.

To repair a run that has been cut or broken, simply form a bridge over the cut with a lead by soldering one end down flat to one side, then soldering the other end down using a heatsink in the middle to prevent the first end from coming loose.

If a pad has been lifted from the board there are three possibilities. First, there are board repair kits that have extra pads to epoxy to the board and be connected with solder. Second, a flatpack can usually be soldered as is (if the pad is still connected to the run) and the other leads hold everything immobile. Finally, if the component is not a flatpack, you can cut the pad off the run and leave enough lead length to bend over and solder directly to the run. These are "jury-rig" methods, but taking proper care in desoldering avoids the situation.

The fundamentals are not hard to master. If you practice as I suggest, you'll be soldering like a pro in no time. Now it's time to build those projects!

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Magazine Source: Due to many inquiries, the source code for the magazine graphic shell is being provided as an informational tool. Included is the actual Basic09 source code and compiled modules on disk, as well as documentation and a printed copy of the source code.

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Hyper-Tech Software

MVCanvas 2.0

Finally a professional full screen editor for OS-9 Level II and Multi-Vue. MVCanvas is the only CoCo graphics editor to support multiple resolutions with up to 16 colors of 64 displayed in 320 x 200 mode with palette animation and full functional clipboard.

MVCanvas also supports multiple fonts with inverse, **bold** underline, and proportional options. Printer support includes: Epson, Star, C.Itoh, DMP (Tandy), with color printer supported for Star NX-1000 R, Citizen GSX-140, Tandy DMP-240 amd CGP-200, Epson LQ-2550 and compatables.

ShellMate 2.2

ShellMate is the epitome of what a point and click file management system was meant to be. With ShellMate, you have access to commands such as copy, move, delete, rename, makdir and free at the touch of a button. It also gives you point and click access to the Public Domain picture display utilities VEFShow and GIFOS9, as well as the archive utility Ar.

The biggest benefit of ShellMate is that it allows you to manipulate large batches of files with one mouse click when either copying, moving, deleting or arcing. You can also easily move through simultaneously displayed Source and Destination directory trees by either double clicking on a subdirectory name, or clicking on the "Parent" command.

System Requirements (both programs)
CoCo3, OS-9 LVL II, Multi-Vue, Disk Drive and 512k
MVCanvas $49.95
ShellMate $24.95
$3.00 S/H $2.50 C.O.D (U.S. only) Nev. res. add 6% sales tax

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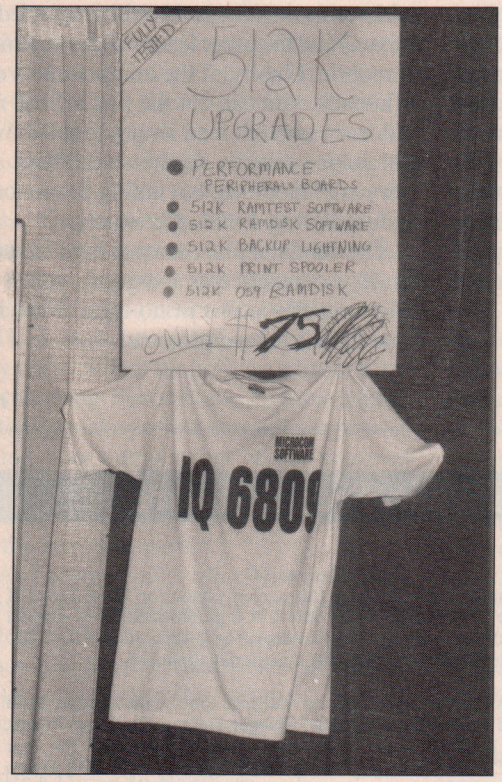
Phone: (702) 362-5346

RAINBOWfest 1990

Here are a few shots of the action at the 1990 RAINBOWfest in Chicago, Illinois. As we've said before, the 'fest is a mainline of information about the CoCo. With bargains on everything from blank disks to hard drives, and a potpourri of technical knowledge to boot, the show provided a perfect opportunity to increase your knowledge (not to mention your system). The hot subject at the '90 Chicago 'fest centered on the new machines. We don't have all our questions answered and are looking forward to the upcoming 1991 show (scheduled for April 26-28 in Chicago). We hope you'll join us for the excitement, and bring your questions, too.



Slashed prices and the highest IQ of all were to be found at the Microcom Software booth.

Yes, it really exists! Lee Veal turned more than a few heads with this gray-case CoCo 1. Upon closer inspection, you would find Serial Number 000001 engraved on its bottom. Lee happened upon this historic unit at a Tandy warehouse sale.

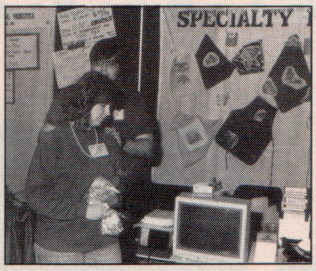
Two fine CoCo-celebs — CoCoPRO! owner Dave Meyers (left) and Delphi CoCo SIGop Marty Goodman.

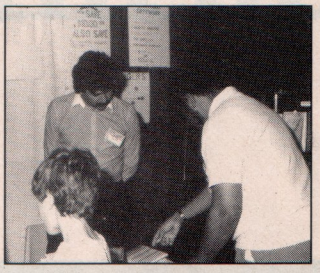
Paul Ward (center) of IMS shares the limelight with OS-9ers Bruce Isted (left) and Kent Meyers.

Operations Director for Tandy's Express Order system Barry Thompson proudly presents Lonnie with the coveted EOS coffee mug.

David Barnes (left) and Ed Hathaway of Second City Software with door-prize winner Katie Mitchell. The '90 fest was Katie's first show.

A favorite with young and old alike, CoCo Cat offers a lap ride to Joshua Rambo of Perry, Michigan.



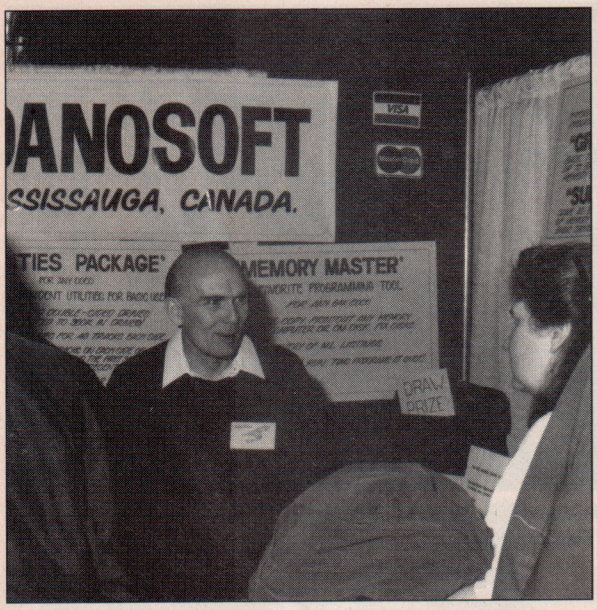


(top left) Bill and Terry Peck of Specialty Projects stock the booth with RAINBOWfest Survival Kits. What would we do without 'em?(bottom left) OS-9 goodies galore! Presiding over the Alpha Software Technologies booth is Keith Alphonso.(top right) Malcolm Cleveland (right), a long-time 'fest attendee, gets help from Gary Davis of Sugar Software. (bottom right) Chris Rochon handles things (literally) for Disto/CRC.

For Oblique Triad, Robert Rivers (left) and Jeff Noyle (foreground) try *Studio Works* on a 1-Meg CoCo 3 with designer Tony DiStefano and independent programmer Chris Swinefurth.

Glen and Bret Dahlgren of Sundog Systems did well with the sinister *Sinistaar. Kyum Gai OS-9* should be ready for the '91 show.

CoCo Community Breakfast speaker Frank Hogg fields questions about his TC-9 Tomcat.



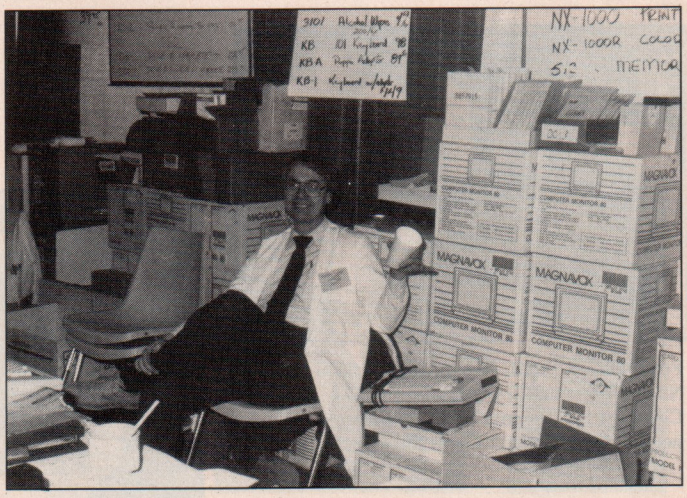
Bill Daniels, author of many fine utilities and applications for Disk BASIC.

Tandy exec Barry Thompson (left) joins workers at the Radio Shack booth.

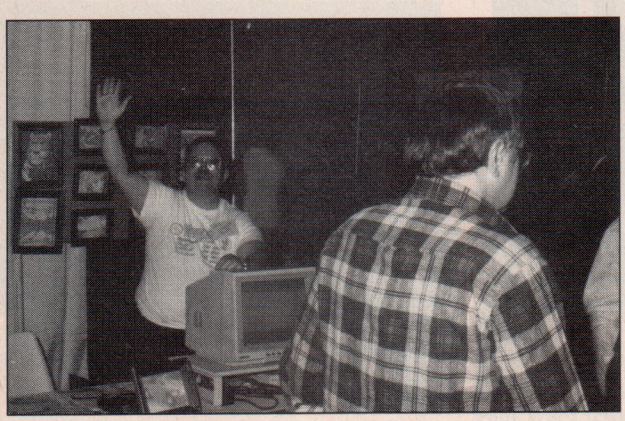
Art Flexser (left) of SpectroSystems notes *ADOS*' features for Robert Jay.

A real music man in anyone's book, Cecil Houk of Rulaford Research provides background music through *Lyra*.

Customer support never stops for Stewart Newfeld of Zebra Systems.



Everybody deserves a break! Ross Litton of Howard Medical takes advantage of what is usually a rare opportunity for exhibitors.



For Supersoft, it's Joe Walker, author of *Supersound*.

The following companies exhibited at the 1990 Chicago RAINBOWfest but are not pictured: The CoCo Corner; Eversoft, Ltd.; Gibbs Labs; Glenside Color Computer Club; THE RAINBOW.

The Assembly Line

Warp Speed Ahead

by William P. Nee

This article discusses the "warping" of pictures. This involves moving some of the points in a picture to slightly different locations, twisting and warping the overall picture. We'll select six control points within the picture, move them, and distort the picture around those points. But before warping an entire screen, we'll remap one figure, which is changing one shape into another.

Remapping all the points of one shape to fit into another shape is a fairly complicated procedure. But if the original figure is always a rectangle and the new figure is always four-sided, the process becomes much easier. For example, let's put all the points that are inside a rectangle Side X long and Side Y high into a four-sided figure bounded by coordinates (U0,V0), (U1,V1), (U2,V2) and (U3,V3). [Point (U0,V0) is always the upper-left corner and coordinates are plotted clockwise from there.] Now we have to convert each old x and y coordinate to new U and V coordinates.

Bill Nee reversed the snowbird trend by retiring to Wisconsin from a banking career in Florida. He spends the long, cold winters writing programs for his CoCo. He can be contacted at Rt. 2, Box 216C, Mason, WI 54856-9302.

First, determine four factors for each coordinate. To compute the U coordinate:

```
A=(U1-U0)/SIDEX; B=(U3-U0)/SIDEY;
C=(U0-U1+U2-U3)/SIDEX/SIDEY; D=U0
```

As a result, `U=A*X+B*Y+C*X*Y+D`

To compute the V coordinate:

```
E=(V1-V0)/SIDEX; F=(V3-V0)/SIDEY;
G=(V0-V1+V2-V3)/SIDEX/SIDEY; H=V0
```

And `V=E*X+F*Y+G*X*Y+H`

To transfer a picture, the color value at (x,y) (obtained with `PPOINT`) is plotted at (U,V). There is one other consideration. Since the new area could be larger than the old area and need more points, it's best to compute all the x and y coordinates using `STEP .5`. This actually lets you replot a figure four times larger than the original.

Let's try an example. Listing 1 remaps a 64-by-64 square starting at (0,0) into a four-sided figure with corners at (161,0), (198,0), (228,80) and (128,80). Lines 60 through 80 get the color value for each point using `STEP .5` and lines 90 through 110 replot those points within the new figure. Even this small area takes quite a while to compute and draw. Imagine remapping the entire screen! Converting the program to machine language doesn't help too much since the program uses floating point math. If we rescale the numbers though, we can use registers and logical shifts to do all the work. To scale the numbers, don't divide by Side X or Side Y when computing values A through H — division comes later as shifts.

Before exploring the machine-language program, here's a short explanation of how it works. The `PMODE 3` screen is divided into 12 rectangles of 32-by-64 bits. The six points where four rectangles meet are control points and can be moved, which changes the shape of each of the four rectangles around them. You can either load a picture of your own or let the program draw one. Then six sets of cross-hairs appear on the screen. Press numbers 1 through 6 to activate the corresponding cross-hairs. Use the arrow keys to move the cross-hairs somewhere within the large box, but don't move into another set of cross-hairs. Press ENTER to set the cross-hairs' position, then press any other number to move another set of cross-hairs. When they're all in position, press the up-arrow key and the machine-language program draws the new picture, remapping each of the 12 old rectangles into new four-sided figures. Since `PMODE 3` always colors two bits at once, some lines may appear thicker than they should in parts of the picture.

The machine-language program in Listing 3 reserves space for it's variables at the beginning. Since all variables are stored in the memory area between $7000 and $70FF, the DP Register is set to $70 to allow faster access. The x and y coordinates are two bytes each since STEP .5 is used. Adding #$80 to each value, along with the current offset from (0,0), gives the current PPOINT location. Lines 640 through 680 rotate a point's color value into the first two bits (if it's the background color, skip to the next coordinates).

Now let's look at the process to "unscale" the coordinates. Lines 750 through 820 divide the current x distance by 32 and save the result since it is needed again. This is multiplied by Value A (poked in by the

Warping involves moving some of the points to slightly different locations, twisting the overall picture.

64K Disk

```
70 ..... 27
END ..... 23
```

Listing 1: WARP1

```
1 'ASSEMBLY LINE: PART 8
2 'WRITTEN BY WILLIAM P. NEE
3 'COPYRIGHT (C) MARCH 1991
4 'BY FALSOFT, INC.
5 'RAINBOW MAGAZINE
10 U0=161:V0=0:U1=198:V1=0:U2=22
8:V2=80:U3=128:V3=80
20 A=(U1-U0)/64:B=(U3-U0)/64:C=(
U0-U1+U2-U3)/64/64:D=U0
30 E=(V1-V0)/64:F=(V3-V0)/64:G=(
V0-V1+V2-V3)/64/64:H=V0
40 PMODE4,1:PCLS:SCREEN1,1
50 FOR R=3 TO 33 STEP 6:CIRCLE(3
2,32),R:NEXT
60 FOR X=0 TO 64 STEP .5
70 FOR Y=0 TO 64 STEP .5
80 Z=PPOINT(INT(X+.5),INT(Y+.5))
90 U=A*X+B*Y+C*X*Y+D
100 V=E*X+F*Y+G*X*Y+H
110 PSET(INT(U+.5),INT(V+.5),Z)
120 NEXT Y,X
130 GOTO 130
```

```
40 ..... 157
130 ..... 16
230 ..... 154
300 ..... 70
390 ..... 37
490 ..... 82
580 ..... 40
660 ..... 129
700 ..... 173
790 ..... 66
END ..... 184
```

Listing 2: WARP2

```
1 'THE ASSEMBLY LINE: PART 8
2 'WRITTEN BY WILLIAM P. NEE
3 'COPYRIGHT (C) MARCH 1991
4 'BY FALSOFT, INC.
5 'RAINBOW MAGAZINE
10 CLEAR 200,&H7000-1:PCLEAR 8
20 DIM U0(11),V0(11),U1(11),V1(1
1),U2(11),V2(11),U3(11),V3(11),D
X(11),DY(11),XX(5),YY(5),A(11),B
(11),C(11),D(11),E(11),F(11),G(1
1),H(11),AA(1),CC(1),N$(6)
30 IF PEEK(&H7019)<>134 THEN LOA
DM"WARP"
40 FOR N=0 TO 11:READ U0(N),V0(N
),U1(N),V1(N),U2(N),V2(N),U3(N),
V3(N):NEXT
50 FOR N=0 TO 11:READ DX(N),DY(N
):NEXT
60 FOR N=0 TO 2:READ N$(N):NEXT
70 FOR N=4 TO 6:READ N$(N):NEXT:
GOTO 330
80 PMODE3,1:PCLS:SCREEN1,1:CO=0
90 FOR R=0 TO 90 STEP 9:LINE(R,R
)-(255-R,191-R),PSET,B:CO=(CO+1)
AND 3:COLOR CO,1:NEXT
100 LINE(0,0)-(255,191),PSET
110 LINE(255,0)-(0,191),PSET
120 EXEC&HADFB:PCOPY 1 TO 5:PCOP
Y 2 TO 6:PCOPY 3 TO 7:PCOPY 4 TO
 8:PCLS
130 FOR X=63 TO 191 STEP 64:LINE
(X,0)-(X,191),PSET:NEXT
140 FOR Y=63 TO 127 STEP 64:LINE
(0,Y)-(255,Y),PSET:NEXT
150 A$=INKEY$:IF A$=CHR$(94) THE
N 190 ELSE IF A$="" THEN 730
160 A=VAL(A$):IF A<1 OR A>6 THEN
 150
170 IF A<4 THEN A=A-1
180 GOTO 620
190 PCOPY 5 TO 1:PCOPY 6 TO 2:PC
OPY 7 TO 3:PCOPY 8 TO 4
200 PMODE3,5:PCLS:SCREEN1,1
210 FOR N=0 TO 11
220 POKE &H7017,DX(N):POKE &H701
8,DY(N)
230 A(N)=U1(N)-U0(N):POKE &H700F
,A(N)
240 B(N)=U3(N)-U0(N):IF B(N)<0 T
HEN POKE &H7010,256+B(N) ELSE PO
KE &H7010,B(N)
250 C(N)=U0(N)-U1(N)+U2(N)-U3(N)
:IF C(N)<0 THEN POKE &H7011,256+
C(N) ELSE POKE &H7011,C(N)
260 D(N)=U0(N):POKE &H7012,D(N)
270 E(N)=V1(N)-V0(N):IF E(N)<0 T
HEN POKE &H7013,256+E(N) ELSE PO
KE &H7013,E(N)
280 F(N)=V3(N)-V0(N):POKE &H7014
,F(N)
290 G(N)=V0(N)-V1(N)+V2(N)-V3(N)
:IF G(N)<0 THEN POKE &H7015,256+
G(N) ELSE POKE &H7015,G(N)
300 H(N)=V0(N):POKE &H7016,H(N)
310 EXEC &H7019:NEXT N
320 EXEC &HADFB
330 CLS:PRINT:PRINT"1> RUN PROGR
AM",,"2> SAVE PICTURE",,"3> LOAD
 A PICTURE","4> END PROGRAM"
340 PRINT:PRINT"PRESS DESIRED KE
Y -"
350 A$=INKEY$:IF A$="" THEN 350
360 A=VAL(A$):IF A<1 OR A>4 THEN
  330
370 ON A GOTO 380,420,420,410
380 RESTORE:FOR N=0 TO 11:READ U
0(N),V0(N),U1(N),V1(N),U2(N),V2(
N),U3(N),V3(N):NEXT
390 FOR N=0 TO 11:READ DX(N),DY(
N):NEXT
400 GOTO 80
410 PMODE4:PCLEAR4:CLEAR200,&H7F
FF:NEW
420 LINEINPUT"PICTURE NAME/EXT -
";NM$
430 IF A=2 THEN PCOPY 5 TO 1:PCO
PY 6 TO 2:PCOPY 7 TO 3:PCOPY 8 T
O 4
435 IF A=2 THEN VERIFYON:SAVEM N
M$,&HE00,&H25FF,&HE00:GOTO 330
440 PMODE3,1:PCLS:SCREEN1,1
450 LOADM NM$:GOTO 120
460 'U,V COORDINATES
470 DATA 0,0,31,0,31,63,0,63
480 DATA 32,0,63,0,63,63,32,63
490 DATA 64,0,95,0,95,63,64,63
500 DATA 96,0,127,0,127,63,96,63
510 DATA 0,64,31,64,31,127,0,127
520 DATA 32,64,63,64,63,127,32,1
27
530 DATA 64,64,95,64,95,127,64,1
27
540 DATA 96,64,127,64,127,127,96
```

```
,127
550 DATA 0,128,31,128,31,191,0,1
91
560 DATA 32,128,63,128,63,191,32
,191
570 DATA 64,128,95,128,95,191,64
,191
580 DATA 96,128,127,128,127,191,
96,191
590 DATA 0,0,32,0,64,0,96,0
600 DATA 0,64,32,64,64,64,96,64
610 DATA 0,128,32,128,64,128,96,
128
620 'CURSOR ROUTINE
630 LINE(2*U1(A),V1(A))-(2*U2(A)
,V2(A)),PSET:LINE(2*U1(A+4),V1(A
+4))-(2*U2(A+4),V2(A+4)),PSET
640 LINE(2*U3(A),V3(A))-(2*U2(A)
,V2(A)),PSET:LINE(2*U3(A+1),V3(A
+1))-(2*U2(A+1),V2(A+1)),PSET
650 LINE(2*U1(A),V1(A))-(2*U2(A)
,V2(A)),PRESET:LINE(2*U3(A),V3(A
))-(2*U2(A),V2(A)),PRESET
660 LINE(2*U3(A+1),V3(A+1))-(2*U
2(A+1),V2(A+1)),PRESET:LINE(2*U1
(A+4),V1(A+4))-(2*U2(A+4),V2(A+4
)),PRESET
670 IF PEEK(341)=247 THEN POKE 3
41,255:V2(A)=V2(A)-1:V3(A+1)=V3(
A+1)-1:V1(A+4)=V1(A+4)-1:V0(A+5)
=V0(A+5)-1:GOTO 630
680 IF PEEK(342)=247 THEN POKE 3
42,255:V2(A)=V2(A)+1:V3(A+1)=V3(
A+1)+1:V1(A+4)=V1(A+4)+1:V0(A+5)
=V0(A+5)+1:GOTO 630
690 IF PEEK(343)=247 THEN POKE 3
43,255:U2(A)=U2(A)-1:U3(A+1)=U3(
A+1)-1:U1(A+4)=U1(A+4)-1:U0(A+5)
=U0(A+5)-1:GOTO 630
700 IF PEEK(344)=247 THEN POKE 3
44,255:U2(A)=U2(A)+1:U3(A+1)=U3(
A+1)+1:U1(A+4)=U1(A+4)+1:U0(A+5)
=U0(A+5)+1:GOTO 630
710 IF PEEK(338)=191 THEN POKE 3
38,255:LINE(2*U1(A),V1(A))-(2*U2
(A),V2(A)),PSET:LINE(2*U1(A+4),V
1(A+4))-(2*U2(A+4),V2(A+4)),PSET
:LINE(2*U3(A),V3(A))-(2*U2(A),V2
(A)),PSET:LINE(2*U3(A+1),V3(A+1)
)-(2*U2(A+1),V2(A+1)),PSET:GOTO
150
720 GOTO630
730 'DRAW NUMBERS"
740 FOR A=0 TO 2:GOSUB 790:NEXT
750 FOR A=4 TO 6:GOSUB 790:NEXT
760 FOR A=0 TO 2:GOSUB 800:NEXT
770 FOR A=4 TO 6:GOSUB 800:NEXT
780 DRAW"C4":GOTO 150
790 X=2*U2(A):DRAW"BM=X;,=V2(A);
C4;XN$(A);":RETURN
800 X=2*U2(A):DRAW"BM=X;,=V2(A);
C1;XN$(A);":RETURN
810 DATA "BF3BR4NG2D7NL3R3"
820 DATA "BF3U1R7D4L7D3R7"
830 DATA "BF3R7D3NL3D4L7"
840 DATA "BF3D3R7NU3D4"
850 DATA "BF3NR7D3R7D4L7"
860 DATA "BF3D7R7U3L7"
```

BASIC program) and saved as TOTAL. Lines 880 through 940 divide the y distance by 64 and also save the result. This time, however, the program checks Value B before multiplying to see if it is a positive or negative number. The product is then added to the current total and resaved.

Since the current x distance (divided by 32) and the current Y distance (divided by 64) have already been computed as N1 and N2, just multiply N1 and N2 together and multiply by Value C after checking the sign. Finally add Value D to the result, along with an extra #$80 to round up, and save the new result. This result is the new U coordinate. The same process is repeated with E through H in lines 1290 through 1670 again using N1 and N2. Since F must always be positive, there is no need to check the sign. Finally, the color value of point (x,y) is PSET at (U,V) (lines 1690 through 1870). The program continues through all the coordinates using STEP .5 (lines 1890-1960) and then sets the DP Register back to 0 when finished. When you've typed in the program, save the source code with W WARP.ASM and assemble it with A WARP.BIN /NS/WE.

The BASIC program in Listing 2 reserves space for graphics and variables in Lines 10-30, and loads the machine-language pro-

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PICTURE BINGO This software makes it possible for you to create your own bingo cards that have pictures instead of numbers. The perfect thing for young children, to practice a foreign language, or as a unique seasonal or personalized party game. Create your own pictures or use any of the 25 pictures included. Uses point and click icons to draw, paint, etc. Has magnified work screen. Will also act as the "caller" and even uses RS speech cartridge (optional) to talk. Requires CoCo 3, disk drive, mouse or joystick, and any of the DMP 105 - 107 or DMP 130 - 134 printers. RS speech cartridge is optional. ONLY $19.95

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gram if necessary. The next four lines read the four U and V coordinates for each of the 12 squares around all the control points, the offset locations from (0,0) for each square, and the DRAW strings for numbers. The menu routine (Lines 330-450) lets you run or re-run the program, save or load a picture, or quit. If you load a picture that relies on artifact coloring, distorting it causes some color loss.

Remapping all the points of one shape to fit into another shape is complicated.

Lines 80 through 140 draw colored boxes with two diagonal lines and copy them to graphics pages 5 through 8. When this or your own drawing is completed, select the number of one of the cross-hairs. Then pressing any of the arrow keys moves that cross-hairs, increasing or decreasing the corresponding U and V coordinates. When you're finished, the picture is copied back from pages 5 through 8, the current A through H values for each of the 12 boxes

Listing 3: WARP

```
00100            ORG     $7000
00110 ACROSS     RMB     2
00120 DOWN       RMB     2
00130 TOTAL      RMB     2
00140 NEWX       RMB     1
00150 NEWY       RMB     1
00160 HORIZ      RMB     1
00170 VERT       RMB     1
00180 SIGN       RMB     1
00190 VALUE      RMB     1
00200 COUNT      RMB     1
00210 N1         RMB     1
00220 N2         RMB     1
00230 AA         RMB     1
00240 BB         RMB     1
00250 CCC        RMB     1
00260 DD         RMB     1
00270 EE         RMB     1
00280 FF         RMB     1
00290 GG         RMB     1
00300 HH         RMB     1
00310 DX         RMB     1
00320 DY         RMB     1
00330
00340            SETDP   $70     ALL VARIABLES START #$70--
00350 START      LDA     #$70
00360            TFR     A,DP    SO SKIP USING #$70
00370            LDU     #P3TAB  'OR' COLOR TABLE
00380            LDD     #0
00390 L1         STD     DOWN
00400            LDD     #0
00410 L2         STD     ACROSS
00420            LDD     ACROSS
00430            ADDD    #$80    ROUND TO NEAREST 1/2
00440            ADDA    DX
00450            STA     NEWX
00460            LDD     DOWN
00470            ADDD    #$80    ROUND TO NEAREST 1/2
00480            ADDA    DY
00490            STA     NEWY
00500
00510 PPOINT     LDA     NEWY
00520            LDB     #32     BYTES PER LINE
00530            MUL
00540            ADDA    #$0E    START OF DISC GRAPHICS
00550            TFR     D,X
00560            LDB     NEWX
00570            LSRB
00580            LSRB
00590            ABX
00600            LDA     NEWX
00610            ANDA    #3
00620            LDA     A,U
00630            ANDA    ,X
00640 PL1        CMPA    #4
00650            BLO     STORIT
00660            LSRA            COLOR ISN'T IN FIRST NIBBLE
00670            LSRA
00680            BRA     PL1
00690 STORIT     TSTA
00700            LBEQ    DONE    DON'T PSET BACKGROUND COLOR
00710            LDB     #$55
00720            MUL
00730            STB     >$B5
00740
00750 NEXT       LDB     #5      DIVIDING BY 2^5
00760            STB     COUNT
00770            LDD     ACROSS
00780 L3         LSRA
00790            RORB
00800            DEC     COUNT
00810            BNE     L3
00820            STB     N1      WILL USE IT AGAIN
00830            LDA     AA
00840            MUL
00850            STD     TOTAL
00860
00870            CLR     SIGN
00880            LDB     #6      DIVIDING BY 2^6
00890            STB     COUNT
00900            LDD     DOWN
00910 L7         LSRA
00920            RORB
00930            DEC     COUNT
00940            BNE     L7
```

```
00950          STB     N2        WILL USE THIS AGAIN, TOO
00960          LDA     BB
00970          BPL     L8
00980          NEGA
00990          INC     SIGN      WE HAVE A NEGATIVE NUMBER
01000 L8       MUL
01010          TST     SIGN
01020          BEQ     L9
01030          COMA              SAME AS 'NEGATE D'
01040          COMB
01050          ADDD    #1
01060 L9       ADDD    TOTAL
01070          STD     TOTAL
01080
01090          CLR     SIGN
01100          LDA     N1
01110          LDB     N2
01120          MUL
01130          ADDD    #$80      ROUND UP
01140          LDB     CCC
01150          BPL     L10
01160          NEGB
01170          INC     SIGN
01180 L10      MUL
01190          TST     SIGN
01200          BEQ     L11
01210          COMA
01220          COMB
01230          ADDD    #1
01240 L11      ADDD    TOTAL
01250          ADDD    #$80
01260          ADDA    DD
01270          STA     HORIZ
01280
01290          CLR     SIGN
```

are computed and poked into the machine-language program. Finally each of the 12 new figures is drawn (Lines 190-310).

After pressing any key and returning to the menu, you can run the program again, save the picture just created, or quit the program and have dinner. When you've typed in the program, save it as WARP2. Let's try an example. Run the program, select Menu Item 1, and let the program draw the design. Then press 2, move the cross-hairs with the up-arrow about 30 spaces, and press ENTER. Press 5 and move the cross-hairs down about 30 spaces. Now let the program redraw this. When it's finished, select rerun. This time move the cross-hairs in the opposite direction; move Cross-hairs 2 down about 30 spaces and Cross-hairs 5 up about 30.

Try increasing the number of control points to see how "warped" a picture you can get. This program also works in PMODE4. Just change the PPOINT routine in the machine-language program to check each bit and see whether or not it is set and increase the size of each square to 64-by-64.

In the next article, we'll see if it's really a "jungle out there". If you have any ideas or requests for a program, please let me know. ❑

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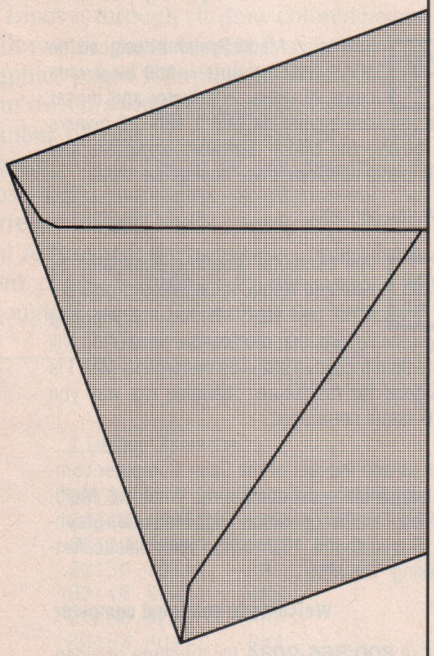

```
01300          LDB     N1
01310          LDA     EE
01320          BPL     L12
01330          NEGA
01340          INC     SIGN
01350 L12      MUL
01360          TST     SIGN
01370          BEQ     L13
01380          COMA
01390          COMB
01400          ADDD    #1
01410 L13      STD     TOTAL
01420
01430          LDB     N2
01440          LDA     FF
01450          MUL
01460          ADDD    TOTAL
01470          STD     TOTAL
01480
01490          CLR     SIGN
01500          LDA     N1
01510          LDB     N2
01520          MUL
01530          ADDD    #$80
01540          LDB     GG
01550          BPL     L16
01560          NEGB
01570          INC     SIGN
01580 L16      MUL
01590          TST     SIGN
01600          BEQ     L17
01610          COMA
01620          COMB
01630          ADDD    #1
01640 L17      ADDD    TOTAL
01650          ADDD    #$80
01660          ADDA    HH
01670          STA     VERT
01680
01690 PSET     LDA     VERT
01700          LDB     #32
01710          MUL
01720          ADDA    #$26    DISC GRAPHICS PAGE5
01730          TFR     D,X
01740          LDB     HORIZ
01750          LSRB
01760          LSRB
01770          ABX
01780          LDA     HORIZ
01790          ANDA    #3
01800          LDA     A,U
01810          TFR     A,B
01820          COMA
01830          ANDA    ,X
01840          ANDB    >$B5
01850          STB     VALUE
01860          ORA     VALUE
01870          STA     ,X
01880
01890 DONE     LDD     ACROSS
01900          ADDD    #$80    STEP 1/2
01910          CMPD    #$1F80
01920          LBLS    L2
01930          LDD     DOWN
01940          ADDD    #$80    STEP 1/2
01950          CMPD    #$3F80
01960          LBLS    L1
01970          CLRA
01980          TFR     A,DP    SET DP BACK TO 0
01990          RTS
02000
02010 P3TAB    FDB     $C030
02020          FDB     $0C03
02030          END     START
```

Novices Niche

Craps

by Douglas Fingliss

Craps is a computer game based on the dice game of the same name. But instead of rolling the dice yourself, the computer rolls the dice for you. This version of the game may not require the throwing arm of the dice game, but steady concentration and determination are essential elements for victory.

To run the game, enter LOAD"CRAPS. You are given $100 with which to bet. You are then asked how much of this amount you want to bet. Your bet is on whether the roll of the dice will be under seven, exactly seven, or over seven. After you have placed your bet, the dice are rolled and the total is shown. If you bet incorrectly, you lose and the amount of the bet is deducted from your cash balance. But if your bet was correct, you win and the amount of the bet is added to your cash balance. To help with calculations, if you bet a roll equals under seven or over seven and are correct, you receive two times the amount bet. If you bet the roll equals exactly seven and are correct, you receive 18 times the amount bet. At no time can you bet more than your cash balance.

Good luck and let the good times roll!

The Listing: CRAPS

```
1 'CRAPS
2 'WRITTEN BY DOUGLAS FINGLISS
3 'COPYRIGHT (C) MARCH 1991
4 'BY FALSOFT, INC.
5 'RAINBOW MAGAZINE
10 CLS
20 MON=100
30 CLS:PRINT"CRAPS-BY DOUGLAS FI
NGLISS-AGE 9":IF MON<0 OR MON=0
THEN 380 ELSE PRINTTAB(10)"CASH:
";MON
40 PRINTTAB(10)"BET:";:INPUTB
50 IF B>MON THEN30 ELSE IFB<0 OR
 B=0 THEN 30
60 CLS
70 PRINT"CASH:";MON
80 PRINT"BET :";B
90 CLS:PRINT"CASH$";MON;"
   BET $";B
100 PRINT@32+9,CHR$(143+64)+CHR$
(143+64)+CHR$(143+64)+"
 "+CHR$(143+64)+CHR$(143+64)+CHR
$(143+64)
110 PRINT@64+9,CHR$(143+64)+CHR$
(143+64)+CHR$(143+64)+"
 "+CHR$(143+64)+CHR$(143+64)+CHR
$(143+64)
120 PRINT@96+9,CHR$(143+64)+CHR$
(143+64)+CHR$(143+64)+"
 "+CHR$(143+64)+CHR$(143+64)+CHR
$(143+64)
130 PRINT"total="
140 D=RND(6):M=RND(6)
150 PRINT:PRINT@192+7,"UNDER  SE
VEN  OVER              SEVEN
    SEVEN"
160 PRINT"WHAT ONE WOULD YOU LIK
E(U,S,O)?"
170 A$=INKEY$:IFA$=""THEN170ELSE
IFA$="U"THEN320ELSEIFA$="S"THEN3
40ELSEIFA$="O"THEN360ELSE170
180 FORX=1TO200:NEXTX
190 PRINT@64+9,D;
200 PRINT@64+9,CHR$(143+64);
210 PRINT@64+11,CHR$(143+64);
220 PRINT@64+22,M;
230 PRINT@64+22,CHR$(143+64);
240 PRINT@64+24,CHR$(143+64);
250 T=D+M
260 PRINT@128+7,T
270 IF F$="U" AND T<7 THEN MON=M
ON+B*2:PRINT@256,"YOU WIN";B*2;"
DOLLARS":GOTO310
280 IF F$="S" AND T=7 THEN MON=M
ON+B*18:PRINT@256,"YOU WIN";B*18
;"DOLLARS":GOTO310
290 IF F$="O" AND T>7 THEN MON=M
ON+B*2:PRINT@256,"YOU WIN";B*2;"
DOLLARS":GOTO310
300 MON=MON-B:PRINT@256,"YOU LOS
T";B;"DOLLARS"
310 FORX=1TO4000:NEXTX:GOTO30
320 PRINT@192+7,"under  SEVEN  O
VER             seven          S
EVEN":F$="U":PRINT@256,"
                               "
330 GOTO 180
340 PRINT@192+7,"UNDER  seven  O
VER             SEVEN          S
EVEN":F$="S":PRINT@256,"
                               "
350 GOTO180
360 PRINT@192+7,"UNDER  SEVEN  o
ver             SEVEN          s
even":F$="O":PRINT@256,"
                               "
370 GOTO 180
380 CLS:PRINT"YOU HAVE LOST ALL
MONEY WOULD   YOU LIKE TO PLAY A
GAIN?";:INPUTT$:IFT$="Y"THENRUNE
LSEIFT$="N"THENCLS:END
```


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DISTO # 1	SC-II + 4 in 1	$200	
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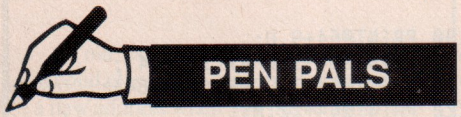
Intercom

An important link in the CoCo community is its ability to communicate with fellow users. If questions arise, a fresh source of information can be invaluable. We here at THE RAINBOW have decided to create "Intercom," an information exchange point for Pen Pals, CoCo Clubs and BBSs.

If you would like a Pen Pal or are running a CoCo Club or BBS, send us a letter including the information listed here to: The Rainbow Intercom, P.O. Box 385, Prospect, KY 40059.

Only those parties who have signed our non-piracy "agreement form" appear in listings of Intercom. Also, please notify us if you want to add or delete any names on this list.



✍ I'm trying to start a CoCo Club in the Wheeling West Virginia area. If you're interested in joining the Tri-State Color Computer Club please contact me at 304-547-4045.

Dennis Hennen
Rt. 2, Box 705
Tridelphia, WV 26059

✍ I'm 17 and would like pen pals from anywhere. I love graphics. I have a CoCo 3, FD-502 disk drive, CM-8 color monitor, direct modem pack, DMP-130A printer, and a CCR-81 tape drive. I will answer all letters I receive.

Shannon Chasteen
309 East Main
Bradford, IL 61421

✍ I have a CoCo 3, disk drive, cassette recorder, and an RGB monitor. I enjoy playing games on both my CoCo and Sega Genesis system. I have a good knowledge of BASIC and a fair understanding of Assembly language. I hope to get into OS-9 and BASIC09 soon. I'm fourteen years of age. I will try to answer all letters.

Armando Perea
844 N. Humbolt, #2
San Mateo, CA 94401

✍ I'm 36 years old and have a 512K CoCo 3, Extended ADOS3, a CM-8, an MPI, a digitizer and assorted drives, modems and printers. I love graphics and digitizing photos, as well as BBSing. Besides the CoCo, I love hard rock music, photography and videography. Seeking pen pals, ages 13 to 80, male and female, with similar interests. I will answer all legitimate letters.

Steve Ricketts
P.O. Box 828
Sandy, OR 97055

✍ I have a 512K CoCo 3, an FD-502 and a Teac 3½-inch disk drive, a DMP-105 and a DCM-106. I'm 31 years young and I enjoy communicating. I will answer all letters, but I prefer computer-related matters. I am also interested in forming a BBS.

Art Foley
600 S. 27th St., #914
Omaha, NE 68105

✍ I am 12 years old and would like to have a pen pal close to my age. I enjoy most games and have a CoCo 3, one disk drive and a DMP-105. I have only had my computer one year. I speak English but I also can speak French fluently.

Amy McFadden
Box 731
Cochrane, Alberta
Canada, T0L 0W0

✍ I am a 20-year-old graduate of John Abbot College in Montreal and am looking for pen pals of any age. I have a CoCo 1, CoCo 2, DMP-105 with tape drive. I have been using the CoCo for eight years and I'm interested in both BASIC and Assembly language. I also enjoy good adventure and action games.

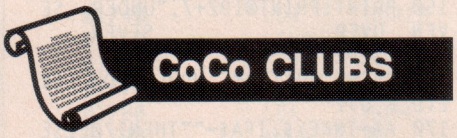
Michael Mattsson
7 Fairwood St.
Pointe Claire, Quebec H9R 2S1
Canada

✍ I am 13 years old and in the eighth grade. I would like a pen pal from anywhere. I own a 64k CoCo 2, FD-502, DMP-130A and a CCR-81 cassette recorder. I would like to correspond with a person who could help me use different programs.

Heather Yurkovich
75 Chesnut St., Box 493
Ellsworth, PA 15331

✍ I am interested in having a pen friend with a CoCo 3. They should be able to help teach German and or be from West Germany. Most importantly they should know and understand how to apply mathematical functions (such as sin and cos) in graphics applications.

Fred J. Slagle
1900 Boatmans Ridge Rd.
Morristown, TN 37814



ARIZONA

☎ Tucson Color Computer Club, Bruce Smith, 3030 Mustang Drive, Tucson, 85708, (602) 747-7859

CALIFORNIA

☎ Citrus Color Computer Club, Orville Beaver, P.O. Box 6991, San Bernardino, 92412-6991, (714) 685-6334

☎ Color America Users Group, Jack W. Eizenga, 3811 N. Foster Ave., Baldwin Park, 91706-3912, (818) 960-8010

☎ Marysville\Yuba City Area CoCo Club, Jim Vestal, P.O. Box 5126, Marysville, 95901, (916) 742-5499

☎ The Sacramento CoCo Club, William W. Drennon, 2444 Wurth CT., Sacramento, 95825, (916) 486-9665, BBS (916) 486-1594

COLORADO

☎ Colorado Springs Color Computer Club, Bud Ward, 1118 Claiborne Road, Colorado Springs, 80906-5513, (719) 392-8268

CONNECTICUT

☎ South Eastern Connecticut Color Computer Users Group, Larry Donovan, 25 Stony Brook Road, Stonington, 06378, (203) 535-4211

FLORIDA

☎ Cross-Country Color Computer Club, Tom Tittle, 860 Gardenia Drive, Royal Palm Beach, 33411, (407) 798-3726

GEORGIA

☎ Atlanta Computer Society, Inc., Alan R. Dages, 4290 Bells Ferry Road Suite 10639, Kennesaw, 30144, (404) 469-5111 voice, (404) 636-2991 modem

☎ Macon-Warner Robins Color Computer Users Group, Francis G. Swygert, 904 2nd Avenue, Robins AFB, 31098, (912) 328-7859

IDAHO

☎ Snake River Color Computer Club, Emil Franklin, 1750 Carmel Drive, Idaho Falls, 83403, (208) 522-0220

ILLINIOS

☎ Chicago OS-9 Users Group, Roger C. Halvorsen, 1598 Ardmore Ave., Glendale Heights, 60139, (708) 469-8174

☎ CoCo Users Group, c/o Greg Adams, 224 Park Drive, Sterling, 61081-3033, (815) 626-4962

☎ Cook County Color Computer Club, Howard Luckey, 10 McCarthy Rd., Park Forest, 60466-2122, (708) 747-0117

☎ Motorola Micro Computer Club, Steve Adler, 1301 East Algonquin Rd., Shaumburg, 60196, (708) 576-3044

☎ Quincy Color Computer Club, Steve Wellman, 1600 Highland Lane, Quincy, 62301, (217) 224-8307

☎ Starved Rock Color Computer Club, Neal Roberts, 1250 E. Bluff, Marseilles, 61341, (815) 795-4894

IOWA

☎ Metro Area Color Computer Club, Joe Cavallaro, 2425 Ave. A, Co. Bluffs, 51501, (712) 322-2438

☎ Mid Iowa CoCo, Terry Simons, 1328 48th, Des Moines, 50311, (515) 279-2576

KANSAS

☎ The Kansas City Color Computer Users Group, Gay Crawford, 1601 Kiowa Drive, Olathe, 66062, (913) 764-9413

KENTUCKY

☎ Hardin County Color Computer Club, Paul Urbahns, 2887 Republic Ave., Radcliff, 40160, (502) 351-4757

LOUISIANA

☎ The CoCo Sig, Christopher Mayeux, 20 Gibbs Drive, Chalmette, 70043, (504) 277-6880 voice, (504) 277-5135 modem

MARYLAND

☎ Arkade, John M. Beck, 3513 Terrace Drive #D, Suitland, 20746, (301) 423-8418

MASSACHUSETTS

☎ TRS-80 Computing CoCo Club, David McNally, 65 Oak Rd., Canton, 02021, (617) 828-8421

MICHIGAN
☎ Color Computer Owners Group, Bernard A. Patton, 388 Emmons Blvd., Wyandotte, 48192, (313) 283-2474
☎ Greater Lansing Color Computer Users Group, E. Dale Knepper, P.O. Box 14114, Lansing, 48901, (517) 626-6917

MISSISSIPPI
☎ Central Mississippi Color Computer Society, Boisy G. Pitre, 6011 I-55 North, Jackson, 39213, (601) 956-9377

MISSOURI
☎ CoCoNuts User Group, Clyde Lloyd, 2116 N. Columbia, Springfield, 65803, (417) 866-8738

NEW YORK
☎ The Island CoCo Club, Dennis Zobel, P.O. Box 426, Massapequa, 11762
☎ Kings Byte CoCo Club, Morty Libowitz, 1063 E. 84th St., Brooklyn, 11236, (718) 763-4233
☎ Twin Tiers CoCo Club, William Cecchini, 319 Irvine Place, Elmira, 14901, (607) 734-0065

NORTH CAROLINA
☎ Norca Users Group, Matthew Royal, Route 21 Box 906, Fayetteville, 28304, (919) 484-1230
☎ Raleigh CoCo Club, P.O. Box 10632, Raleigh, 27605, (919) 878-3865
☎ The Tandy Color Computer Users of Charlotte, Eric Stringer, 1022 Noles Dr., Mt. Holly, 28120

OHIO
☎ The Columbus and Central Ohio Color Computer Club, Richard Heber, 546 Woodside Drive S.W., Pataskala, 43062, (614) 927-3357
☎ Dayton Area Color Computer Users Group, John Teague, 308 Orangewood Drive, Kettering, 45429, (513) 434-9168
☎ Dayton Color Computer Users Group, Steve E. Lewis, 4230 Cordell Drive, Dayton, 45439, (513) 299-3060
☎ The Greater Toledo Color Computer Club, Bill Espen, 1319 North St., Bowling Green, 43402, (419) 471-9444
☎ Tri-County Computer Users Group, Ron Potter, 10914 Oliver Road, Cleveland, 44111, (216) 476-2687

PENNSYLVANIA
☎ Cumberland Valley Users Group, Thomas Martin, 9085 Newburg Road, Newburg, 17240, (717) 423-5525
☎ Johnstown Area Color Computer Users Group, Albert Baldish, 111 C St. Apt #1, Johnstown, 15906, (814)535-1497
☎ Pittsburgh Color Group, Ralph Marting, 309 Frazier Drive, Pittsburgh, 15235, (412) 823-7607

RHODE ISLAND
☎ New England "CoCoNuts" Color Computer Club, Arthur J. Mendonca, P.O. Box 28106 North Station, Providence, 02908, (401) 272-5096 (Sig3)

SOUTH CAROLINA
☎ Spartanburg CoCo Club, Jesse W. Parris, 152 Bon Air Ave., Spartanburg, 29303, (803) 573-9881

SOUTH DAKOTA
☎ Empire Area Color Computer Users Group of South Dakota, Carl Holt, P.O. Box 395, Brandon, 57005, (605) 582-3862

TEXAS
☎ CoCoNauts — Space City, Arthur J. Volz, 16218 Brinkwood Drive, Houston, 77090, (713) 580-6420
☎ The Codis CoCo Symphony, William C. Garretson, 2902 Harvard St., Irving, 75062, (214) 570-0823
☎ Mid Cities TRS-80 Users Group, Rob Yoder, P.O. Box 171566, Arlington, 76003, (817) 535-7931

VIRGINIA
☎ Richmond Area Color Computer Organization, William T. Mays Jr., 6003 Westbourne Drive, Richmond, 23230, (804) 282-7778
☎ Southwestern Virginia Color Computer Club, Ricky Sutphin, Route 1 Box 20, Henry, 24102, (703) 365-2018

State/City	BBS Name	Access Number	Parameters (Baud rate-Parity-Word Bits-Stop Bits)	SysOp
Arkansas				
Jonesboro	The 8-Bit Wonderland	(501) 931-9528	300/1200/2400-N-8-1	Mike Smith
Peach Orchard	Communications Central BBS HST	(501) 249-3814	300/19,200-N-8-1	Perry Parsons
Sheridan	The Grant County BBS	(501) 942-4047	300/1200/2400-N-8-1	Eddie Gilmore
California				
Hollywood	Zog's Cavern BBS	(213) 461-7948	300/1200/2400-N-8-1	Alan Sheltra
Laguna Hills	Rainbow Connection Info Service	(714) 831-6530	300/1200/2400-N-8-1	Eric Levinson
Marysville	09-Online BBS	(916) 742-6809	300/1200-N-8-1	Jim Vestal
Colorado				
Colorado Springs	The Time Safari	(719) 635-7228	300/1200-N-8-1	David Vallier
Florida				
Cocoa Beach	KB Enterprises' CEBBS[1]	(407) 799-3282	300/1200-N-8-1	Kevin Berner
Miami	A Little R S R	(305) 266-1099	300/1200-N-8-1	Robert Jones/Robert Caraballo
Hawaii				
Ft. Shafter	CoCo'Nuts BBS Service	(808) 845-7054	300/1200/2400-N-8-1	Tommie Taylor
Illinois				
Carpentersville	The Pinball Haven BBS	(708) 428-8445	300/1200/2400-N-8-1	Jeffrey R. Chapin
La Grange Park	S & V BBS	(708) 352-0948	300/1200/2400-N-8-1	Paul Jerkatis
Kansas				
Beloit	Kansas Konnektion BBS[2]	(913) 738-3938	300/1200/2400-N-8-1	Gary N. McCarty
Louisiana				
Harvey	The Node 3	(504) 347-4320	300/2400-N-8-1	Gene Clifton
Massachusetts				
Worcester	Gosub BBS	(508) 756-1442	300/1200/2400-N-8-1	Richard Bostock
Michigan				
Taylor	J & L's CoCo Corner	(313) 292-4713	300/1200/2400-N-8-1	Jim Snider

Continued on next page

WASHINGTON
☎ Spokane Color Computer Club, Richard Baysinger, W. 2217 Sanson, Spokane, 99205, (509) 326-2793 voice, (509) 325-6787 modem

WEST VIRGINIA
☎ Huntington Area Color Computer Symposium, Jim Bush, P.O. Box 391, Lesage, 25537-0391, (304) 736-5314

AUSTRALIA
☎ Australian National OS-9 Users Group, Gordon Bentzen, C/- 8 Odin Street, Sunnybank, Queensland, 4109, (07) 345-5141
☎ Brisbane Southwest Colour Computer Users Group, Bob Devries, 21 Virgo St., Inala, Queensland, 4077, (61)-7-3727816

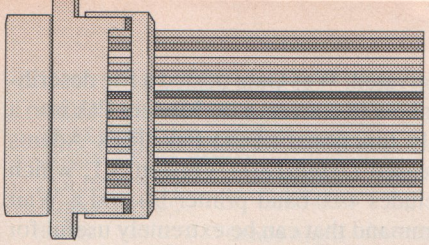
CANADA
☎ Club Ordinateur Metro Inc., William Manning, 3020 D'Angouleme, Tracy, Quebec, J3R 3B3, (514) 742-3692
☎ Calgary Colour Computer Club, Gerry McCleary, P.O. Box 22, Station M, Calgary, T1Y 5C4
☎ Le Club D'Ordinateur Couleur du Quebec Inc., 7110 8 e. Ave, St-Michel, Montreal, Quebec, H2A 3C4, (514) 729-8467
☎ Les CoCophiles Du Sud-Ouest, Jean Labrose, 20 Ste-Julie #A, Vaudreuil, Quebec, J7V 1B5, (514) 455-0486
☎ Halifax Dartmouth Color Computer Users Group, David H. Haley, Comp. #7 Greenforest Subdivision, RR#1 Lower Sackville, Nova Scotia, B4C 2S6, (902) 864-0454
☎ Moncton-Dieppe-Riverview CoCo Club, Philippe Lantin, 77 Ninth St., Moncton, New Brunswick, E1E 3E5, (506) 382-7706

GERMANY
☎ OS-9 Users Group in Europe, Burghard Kinzel, Leipziger Ring 22A, D-5042 ERFTSTADT

PUERTO RICO
☎ Puerto Rico Color Computer Club, Luis R. Martinez, P.O. Box 2072, Guaynabo, 00657-7004, (809) 799-8217 or (809) 728-2314

Minnesota				
Brainerd	Brainerd 4-Way[3]	(218) 828-1144	300/1200/2400-N-8-1	Mike Lowe
New Hampshire				
Allenstown	The CoCoBean BBS	(603) 485-8682	300/1200/2400-N-8-1	David Bean
New Jersey				
High Bridge	Hilltop BBS	(201) 638-5698	300/1200/2400-N-8-1	Guy Silliman
Mercerville	TAO BBS	(609) 587-2672	300/1200/2400-N-8-1	Bob Watson
New York				
Wappingers Falls	The Dutchess CoCo	(914) 838-1261	300/1200/2400-N-8-1	Chris Serino
North Carolina				
Concord	The Stargate BBS	(704) 788-7867	300/1200/2400-N-8-1	Jim Brock
Ohio				
Bellaire	The Phantasm BBS	(614) 676-2505	300/1200/2400/9600-N-8-1	Dave Roth
Oklahoma				
Tecumseh	Pat BBS[4]	(405) 598-5082	300-N-8-1	Pat Aldridge
Oregon				
Portland	Carvings Unlimited	(503) 286-4030	300/1200/2400-N-8-1	Raymond Choat
Pennsylvania				
Conshohocken	Charlie's Help Line	(215) 825-3226	300/1200-N-8-1 or N-7-1	Charles DiMartino
Johnstown	CoCo Electronic BBS[5]	(814) 535-1497	300/1200/2400-N-8-1	Albert Baldish
Palmer	ASCII =80=	(215) 252-1608	300/1200/2400-E-7-1	Nevin Keller
Rhode Island				
Central Falls	The Weather Connection II BBS	(401) 728-8709	300/1200/2400-N-8-1	Eric Chew
Tennessee				
South Pittsburg	Base-Net BBS	(615) 837-8352	300/1200/2400-N-8-1	Howard Bacon
Virginia				
Fall Mills	Clem's Corner BBS[6]	(703) 322-4053	300/1200-N-8-1	Richard Douglas Bailey
Henry	Public Access[7]	(703) 365-2018	300/1200-E-7-1 or N-8-1	Ricky Sutphin
Richmond	Tree House BBS	(804) 744-0157	300/1200/2400-N-8-1	Doug James
Wisconsin				
Gays Mills	CoCo BBS	(608) 735-4509	300/1200/2400-N-8-1	Robert & Daven Howard
Marinette	Phoenix Interstate Data Systems[8]	(715) 732-1036	300/1200/2400/9600-N-8-1	Joe Boburka
Marshall	Madison Tandy Users BBS	(608) 655-3806	300/1200/2400-N-8-1	Fran Selje
Canada				
Lunenburg, Nova Scotia	Color Nova BBS	(902) 634-3095	300/1200/2400-N-8-1	John D. Cleveland
Montreal, Quebec	Club D' Ordinator Couleur du Quebec	(514) 257-0250	300/1200-N-8-1 Real Martel	Ghislain Belley

Notes:
[1]KB Enterprises' CEBBS is up 5 p.m. to 9 a.m. seven days a week (EST).
[2]Kansas Konnektion BBS is up from 10 p.m. to 7 a.m.
[3]Brainerd 4-Way is up from 8 p.m. Saturday to 5 p.m. Friday.
[4]Pat BBS is up 5 p.m. to 9 p.m. weekdays and 10 a.m. to 10 p.m. weekends. This new BBS is counting on you for uploads.
[5]CoCo Electronic BBS is up 8 p.m. to 6 a.m. 7 days a week.
[6]Clem's Corner BBS is up from 6 p.m. to 11 p.m. seven days a week.
[7]Public Access is up from 12:30 a.m. to 9 a.m. Monday through Sunday.
[8]Phoenix Interstate Data Systems has a .75/hr charge for premium services, paid in advance.



The Mad Slasher

by Eddie Kuns
OS-9 SIG Database Manager

One of the more useful commands Delphi offers is the /SEND command. As with all other "slash" commands (so named because you must start the command with a slash as the first non-blank character on the line), you can use this command from nearly anywhere on Delphi except Mail. /SEND is used to send messages to other Delphi users in the same SIG.

Let me back up a moment for review. As many of you already know, Delphi is divided into a number of Special Interest Groups, or SIGs. Among the many SIGs on Delphi are the CoCo and OS-9 Online SIGs, both in the Group menu from the Delphi Main menu. This division makes it easier to talk to someone with similar interests. If you talk to someone in Conference in a SIG, you are probably talking to someone who shares some interests with you!

To find out who is currently in the same SIG you are in, use the /WHO command. Usernames of people logged on to Delphi but in other SIGs do not show up with the this command. You can even tell who is in Conference in the SIG you are in since conference members' names are surrounded by parentheses. Below is such an example:

```
COCO> /who

MARTYGOODMAN, (GREGL), EDDIEKUNS
LMCCLURE, TRISHEXEL, DESKMAN
BRIANV,(BOBKEMPER), RICKGRAY
10BAUD, (TIMKIENTZLE), KELLYH
```

Eddie Kuns is pursuing a PhD in physics at Rutgers University. He lives in Aurora, Illinois and works as a programmer and researcher at Fermilab. Eddie is co-manager of the CoCo SIG; his username is EDDIEKUNS.

You can see that Greg Law (GREGL), Bob Kemper (BOBKEMPER) and Tim Kientzle (TIMKIENTZLE) are all in Conference, although not necessarily all talking to one another. The rest of the people are in either the CoCo SIG or the OS-9 Online SIG.

Why either? Both SIGs are related to the Color Computer and are linked. This means many commands that work only within one SIG, such as /WHO and /SEND, treat the CoCo and OS-9 Online SIGs as a single SIG. Thus, /WHO lists all people currently in both SIGs and /SEND allows you to send a message to a person in either SIG as long as you are currently in one or the other. Also, because they are linked, you can pass directly from one SIG to the other without going back to the Groups menu or the Delphi Main menu. Use the "OS-9 Online" selection in the CoCo SIG to go to the OS-9 SIG and the "Portal to CoCo SIG" option in the OS-9 SIG to go to the CoCo SIG. You only need to type the first couple of characters of each command.

Notice that the entry log (/ENTRY command) I mentioned a couple of months ago only works within your currently selected SIG. The CoCo and OS-9 SIGs each keep separate entry logs, so it's possible that someone can have a different real name setting for each SIG. Also, the entry log keeps track of the last time each person entered each SIG and not the last time each person was on Delphi.

One of the more useful slash commands is /HELP FULL. It lists all valid slash commands. For a partial list of the more useful ones, use /HELP. It is worthwhile to use the /HELP command occasionally since new commands periodically appear, especially in conference. But I'm getting ahead of myself (that's next month's topic!).

Back to /SEND. You can send to more than one person by listing the names separated by commas. For example:

```
FORUM> /send gregl,rickadams Hel
lo! Ready to go into conference?
```

When you receive a message someone has sent using /SEND, it appears as follows:

```
GREGL>> Sure. I'll see you in a
minute.
```

These messages don't affect anything you are doing on Delphi. However, your screen can become jumbled if you receive a lot of messages and you may lose track of what you are doing. If you don't want to be interrupted by people sending messages to you, use the /BUSY command. After typing /BUSY, you won't receive any messages. The sender is notified that you are busy and cannot receive messages right now. Enter /NOBUSY when you again want to receive messages. The /BUSY setting lasts until you type /NOBUSY or log off Delphi.

As previously mentioned, you can use the slash commands from almost anywhere on Delphi, even when entering a message in Forum. Just make sure the slash is the first character you type on a line. Delphi takes the action and leaves you where you were without interruption to the Forum message.

In fact, there are some useful slash commands that only work when entering a text message, as in Forum and when editing the description of an upload. These commands are /EDIT, /LIST and /DEL. /EDIT drops you into your selected editor with the text of the message as entered. /LIST records the lines you have entered. This is useful if your screen gets messed up or if you forget what you said at the beginning of the message. Finally, if you want to delete the last line of text and re-enter it, use /DEL. You can repeat this command until you have deleted all of the lines you entered. As

always, use Control-Z to send a message and Control-C to abort. You can also send the message using /EXIT and abort with /QUIT.

The final slash command I'll mention now is /TIME. If your terminal program doesn't keep track of how long you've been logged on, you can use the /TIME command to find out. It reports the current date and time as well as how long you've been online.

Database Information

There is a lot of information appearing in the databases about the new OSK machines in the OS-9 SIG. This month is no exception, with several files describing the Delmar System IV, the IMS MM/1 and the FHL Tomcat system in General Information. Mike Sweet has been busy. He posted *Ed* Version 3.0 and a patch to 3.0A in Applications, ar Version 1.3 in Utilities, and CGFX.L VERSION 7 in Programmer's Den. The new release of ar adds some nice new features: ar now ignores Xmodem and Ymodem pad characters and it sets file attributes automatically when you extract a file from the archive so you don't have to use attr to do it by hand.

Leslie Ratliff wins the patience award this month for uploading a large number of GIFs in Graphics & Music, just barely beating Steve Ricketts and Richard Trasborg in the CoCo SIG's CoCo 3 Graphics database. The submission *Galaxies Simulation* graphically shows what happens when galaxies collide! This sounds like a program to show your place in the universe. For the motivated, Wes Gale posted a file describing how to convert a DC Modem Pak into a fully functional RS-232 Pak. Rick Adams released *DelphiTerm* Version 3.1, which includes 4800-baud printer I/O and a Wait command that can be extremely useful for auto login scripts.

News

The big news in the OS-9 SIG this month is that the OS-9 version of *Kyum-Gai: To Be Ninja* is finally available! This game proves that high-powered action games are possible under OS-9. The game was originally written by Glen Dahlgren (SUNDOGSYS) under Disk Extended Color BASIC and was ported to OS-9 by Kevin Darling (OS9UGPRES). I was involved in the project as well. ❑

Database Report

OS-9 SIG

General Information

BATTERY BACKUP ARTICLE	
PAULSENIURA	Paul Seniura
DELMAR SYSTEM IV ANNOUCEMENT	
POLTERGEIST	Brian Wright
MM/1 VS TANDY 2500	
POLTERGEIST	Brian Wright
SYSTEM IV COMPUTER INFO	
JOHN09R	John Baer
ATLANTA TIME!	
DAVEMYERS	Dave Myers
OS-9 HELP FILES	
JMLSOFT	Jim McDowell
FHL TOMCAT COMPUTER INFORMATION	
JAYTRUESDALE	Jay Truesdale
STARTUP	
SEBJMB	Jeff Blower
ATLANTA COCOFEST INFO UPDATE	
DAVEMYERS	Dave Myers
NEWLEV2.PAK	
XLIONX	Mark W. Farrell

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SELECT ANY FILE AS BOOT FILE	
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CHYDE	Chris Hyde
TEXT SCAN AND FILTER UTILITIES	
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SUPERCOMM DOCUMENTATION	
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RIBBS SYSOP UTILITIES	
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ACCESS COLOR BBS V2.3 INFO	
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You read THE RAINBOW because you love your Color Computer, so if you want a creative outlet and a chance to examine quality hardware and software, with your observations published nationwide, we want to hear from you.

Send us a cover letter with your name, address, occupation, list of equipment, areas of general interests, and a sample review of a CoCo product you are currenly using. We look forward to your response. After all, we already see you have the best taste in computers.

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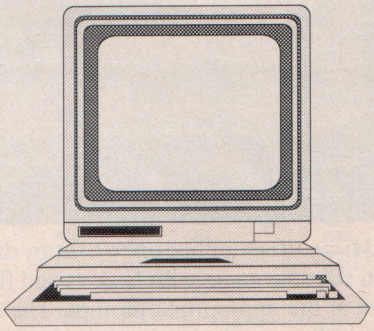
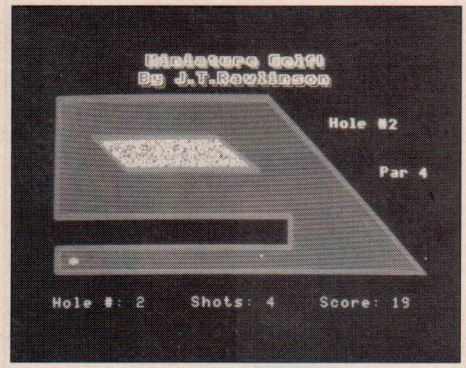


Game CoCo 3

Minigolf

Minigolf is a miniature golf program written for the CoCo 3 equipped with a disk drive, an RGB monitor and a joystick. *Minigolf* features Hi-Res graphics, sound effects and a full 18-hole course with various pars on each hole. Par for the course is 106, and you must re-play each hole until you shoot par or under.

Loading *Minigolf* is as simple as typing RUN "MG" and then pressing ENTER. After the game loads, a title screen is displayed. Simply press the right joystick button to start the first hole. Each hole is shown at a slight 3-D angle to provide some degree of perspective and realism. A power bar is displayed on the left side of the screen so you can hit the ball with varying degrees of force. The longer the power bar, the harder you hit the ball. The direction you pull the joystick lever determines the direction the ball travels. It's quite simple and easy to get used to. Each hole displays the par and the number of total strokes taken, so it's easy to see how well you are doing. *Minigolf* also incorporates some hazards similar to those found on a real miniature golf course. There are blow bars that, when hit, move your ball to a different location. Hitting a tube makes your ball travel down a pipe to another location. Some holes have hills that simply make your ball roll unpredictably. Then there are returns that are similar to pinball bumpers except hitting one sends your ball back to the tee point.



Minigolf is supplied on two flippy disks. You start the game with Disk #1 and flip it over at the appropriate prompt. The program tells you when to insert the next disk to continue play. The short documentation is on one of the disks and can be read by typing RUN "DOCS" and pressing ENTER.

Minigolf is a fun and challenging game that can be enjoyed by the entire family. After each round, the computer assigns a rating to the player, with Pro being the best. Ball movement is smooth and realistic, but I'd like to see the ball a little larger than the small dot as represented. After a few hours of *Minigolf*, I am convinced that golf of any type is not the sport for me. Thankfully, *Minigolf* is not a public course.

(J.T. Rawlinson Software, 361 St. Germain Avenue, Toronto, ON M5M 1W6, Can-ada; 416-782-2217; $21.95 plus $3 S/H)

— Jerry Semones

Testing Aid CoCo 1, 2 & 3

Brainbuster Examiner

As Seneca, the ancient Roman philosopher, once said, "Leisure without study is death." One way to avoid chronic brain death is to get involved in some sort of trivia game, displaying the range and depth of your knowledge to other people while exercising your gray matter. But after you've soundly beaten all the neighbors and your family has hidden those games, then what?

Pull out The Trading Post's *Brainbusters: Examiner 3* and the *Trivia Quizzes* disks and test yourself. You don't need anybody else, although you can also arrange it so somebody else takes the same series of questions and compares their score with yours. The programs are basically set up for the CoCo 3, but can be ordered for the CoCo 2. If you order them, you should say which version you want.

You can back-up both disks. The instructions recommend doing so. The next thing is to configure the test disk for desired program options, such as whether or not to display the correct answer, printer baud rate and number of disk drives. That's also easy, a far cry from the configuration rituals involved in OS-9, for example. If English is your primary language, and you've used your CoCo for more than a week, you'll be exercising your brain in about five minutes, which includes the time it takes to open the envelope. In short, the instructions are straightforward, clear and concise. Do this, do that and start having fun.

The disk I received containing the test questions has all four files on it. They are normally sold separately, though. The first had 25 questions and the rest had 50 questions each. Name a subject. Okay, now name another subject. You can pretty well bet there is a question about it among these 160 multiple-choice and true/false puzzlers. Presidents to poets; rock stars to Fibber McGee. ("Who's that?" you ask. Ah, you young sprats who missed out on the golden days of radio; back when you heard things other than news and music; when you were allowed to use your imagination instead of getting everything stuffed into your head. Suffer.)

Of course I took the examinations myself! How else to evaluate everything? For those who possess inquiring minds, my scores were 80 percent, 90 percent, 86 percent and 80 percent. Rock stars and a certain amount of "Cranial Vapor Lock" did me in a few times. Cranial Vapor Lock strikes contestants on television game shows, which explains why we at home do better than they do. We don't have any money at risk. It also strikes software reviewers when they are operating past their bedtime and rushing things a bit.

There were a couple of minor typographical errors in the quizzes. For example, Freund instead of Freud. Question 44 in Quiz #4 brought up a puzzling situation. Up until then, I had no idea that Tonto's best friend was Tarzan. This is a facet of the faithful Indian companion previously unknown to me. You suppose Tonto learned the words "Kemo Sabe" from the famous apeman and it means something really ugly? [*Editor's Note: We have been informed that these problems have been corrected.*]

If you want to develop your own quizzes to dazzle the neighbors, your family and especially your grandchildren, The Trading Post also sells a program titled *Brainbusters Testwriter*, which is the subject of another review.

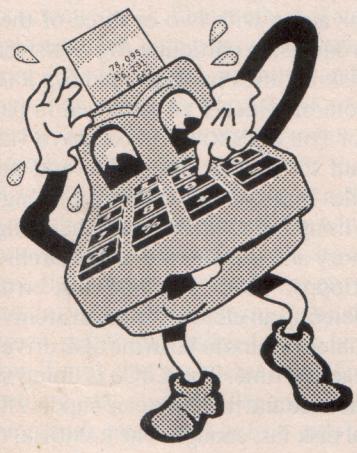
In the meantime, have a lot of fun with the *Examiner 3*. Since each quiz is relatively short, and the program keeps the scores for you, an evening could be spent letting guests test their knowledge, as individuals, teams or whatever.

And, since everybody is taking the same test, nothing can be blamed on the roll of the dice. "Well, gee. If I always landed on History I'd do better, too." No cop-outs with this one.

All in all, this is a good deal. It runs quickly, is simple to set up and is fun.

The Examiner uses 32K. A 25-question

Add UP These Public Domain Values!



UTILITIES 1-8

• 12 Programs Each, 1-4 Require Disk •

U1 - Backup 35, Basicmap, Timer, Tape-to-Disk, +
U2 - Customize, DiskTest, MasterDisk, Offset, +
U3 - View 64, DiskAid, Disk Library, Atari, +
U4 - AutoBoot, MacPicture, StateLog, UniBack, +
U5 - Disassembler, Graph, PaintPot, Squeeze, +
U6 - Clock, Llist 32, , MiniDos, Pixcomp, +
U7 - Head Print With 30 Mini Pictures
U8 - Fig Forth Language With Tutiorial

EDUCATION 1-4

E1 - 12 Programs For Young Kids
E2 - 12 Programs For High School Kids
E3 - 11 Programs Teaching Coco Commands
E4 - 5 Graphics Programs About Australia

GRAPHICS 1-14

GR1 - Atlanta, Cube, Space, +
GR2 - Objects, Wargame, Worldmap, +
GR3 - 9 Coco 3 Graphic Programs
GR4 - 22 Coco Max Pictures
GR5 - 22 Coco Max Pictures
GR6 - 22 Coco Max Pictures
GR7 - 15 Coco Max Pictures
GR8 - 22 .Bin Pictures
GR9 - 22 .Bin Pictures
GR10 - 14 Large .Bin Pictures
GR11 - 8 Mge Pictures
GR12 - Coco Max 3 Pictures
GR13 - Macpaint Graphic Editor
GR14 - 5 Macintosh Pictures

Music 1-7

M1 - 8 Utilities & 8 Songs
M2 - 17 Musica Files
M3 - 16 Musica Files
M4 - 16 Musica Files
(Requires Musica)
M5 - 25 Orchestra Files
M6 - 23 .Bin Files Ready To Run
M7 - 23 .Bin Files Ready To Run

GAMES 1-11

• Each Disk/Tape Contains 12 Programs •

GA1 - 3D Tic Tac, Missile, Poker, Tycoon, +
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GA5 - Blackjack, Lazer, Tipan, Utopia, +
GA6 - Kings, Maze, Shuffle, Tempest, +
GA7 - Chess, City, Life, StarTrek, +
GA8 - Chute, Germ, Hurkle, Lunar, +
GA9 - Civil War, Go-Fish, Stock, UFO Maze, +
GA10 - Cave, HiLow, Scramble, Word Hunt, +
GA11 - Biorythms, Craps 3, Gunner, Martians, +

ADVENTURES 1,2

Ready To Run
Order A1 Or A2

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CAVERN QUEST3 PT. 2
BUILDERS HELPER
TARZAR IV
ADDRESS IT
ANIMAL GRAPHICS
*SKYWAY

ISSUE #92, FEB 1990
PENTA-SAME
ROTISSERIE LEAGUE
NICK'S QUEST
SOLITAIR
EDUCATION 4
IBM - BASIC
BASEBALL CARD ORG.
MUNCHY 3
RIVER RAID 3
*CUBER

ISSUE #93, MAR 1990
MR. MOVIE
INVADERS
COCO3 RECIPE MACHINE
SILVERCAPE 3 ADV.
BABY-SITTER'S BASE
BIBLE SCRIPTURE
VOCABULARY QUIZ
DROP PACK
DOCTOR WHO 3
*GRABBER

ISSUE #94, APR. 1990
FLASH CARD
REAL ESTATE LISTINGS
BIBLE QUESTIONS 1
SPELLING QUIZ 1
NO LEFT 3
PICTURE VIEWER 3
TANK SHOWDOWN
TARZAR 5 ADVENTURE
GENESIS
*FOURCUBE

ISSUE #95, MAY 1990
DREAMTIME ADVENTURE
XT/AT SYSTEMS
BIBLE QUIZ 2
16 FLAGS
FRACTIONS
SOLITIARE PUZZLE 4
512K RAM DRIVES 3
FOOD FACTORY 3
WHO PART 2
*TRAPFALL

ISSUE #96, JUN 1990
ENTREPENEUR
DR. PHRED!
PRINTER FONT CODES
BIBLE QUESTIONS PT. 3
CALO ADVENTURE
FORM MAKER
DRAGON ESCAPE
PLANE EXPLORER
WHO PART 3
*MS. MAZE

ISSUE #97, JULY 1990
FCC EXAM HELPER
EMPLOYEE SCHEDULE
FLYING SAUCER ADV.
SPEECH AID
MOWER MADNESS
JET TRIVIA
INSTANT CALENDAR
WORLD MASTER 3
AIR WAR 3
*SKRAMBLE

ISSUE #98, AUG. 1990
FLIPPY TUTORIAL
RECIPE/MEAL/GROCERY
DUNGEON MAZE
SNOW SKI
HOT LOAD
SHIP WAR
ERROR TRAP
SPACE WAR 3
MAZE MASTER 3
*WIZARD'S DEN

ISSUE #99, SEPT. 1990
IDEA TREE
MASTER'S LABYRINTH
MORSE CODE
TELESALE CONTACTS
PROMISED LAND QUIZ
PROPOSAL WRITER
ALPHABET SCRAMBLE 3
MAGIC PUMPKIN
DR. WHO3 PART 4
*FANGMAN

ISSUE #100, OCT. 1990
ZOT MIND GAME
SUPER TEXT EDITOR
SUPER TEXT FORMATTER
TURTLE SEARCH 3
COAST TO COAST
EASY BASIC 3
DRAGON ADVENTURE
WRITE OUT UTILITY
TRYTHIS
*DONUT DILEMMA

ISSUE #101, NOV. 1990
GOSSIP
COST ESTIMATOR
SALON INVENTORY
PERSONAL STATISTICIAN
BINGO CALLER 3
ALAIX - 3
DEATH HUNT
512K/RAM/CATALOGER 3
DUCK HUNT
*THE FROG

ISSUE #102, DEC. 1990
REAL ESTATE ANALYSIS
COCO PAYROLL
DR. STRANGE ADVENTURE
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file costs $5.50. Each of the 50-question files costs $10.95. Add $3 S/H to any order. Specify CoCo 1, 2 or 3.

(The Trading Post, P.O. Box 3453, Carbondale, IL 62902-3453; $24.95 plus $3 S/H)

— John M. Hebert

Utility CoCo 3

CoCo Archiver

Is it time for spring cleaning already? Maybe you should start with your Color Computer work area. Your CoCo is dusted off (and hopefully covered when not in use) and the monitor screen is freshly cleaned. The disk drives are nice and straight (in my case, all four of them in two little steel cases) with their plastic dust jackets. Now,

Along with its main focus, *CoCo Archiver* contains several related utility functions.

house of having to go out and do it manually. It also lists the disk's directory in four columns to accommodate virtually any file in any format, regardless of how full it is.

Two useful abilities of this product are the addition and deletion of files from existing archives. This allows you to later add related files to the archive or, if you decide you don't need to save all items in the archive, delete them without having to re-

computer room, now I've got time to start cleaning the rest of the house. Hit only dirty windows . . .

(Danosoft, Box 134, Station A, Mississauga, ON L5A 3X1, Canada; 416-897-0391; $19.95 U.S., $24.00 Can; plus $2.50 S/H; Ontario residents add 8% tax)

— Fred Tom

week's worth of refuse into a single bag. The archive utility reads a file (BASIC program, ASCII editor file, binary machine language program, data file) and uses a data compression method to squeeze it into a smaller package. Then, a large group of related files can be banded together in a single archive and stored on an out-of-the-way disk. Think of it as tying up old copies of THE RAINBOW for storage in the attic. You'll want to keep those around for later reference, but now they're kind of in the way. Instead of many small files scattered on a disk, you wind up with one larger file that includes all the little ones. The whole takes up less room than the sum of its parts.

Danosoft, creators of all kinds of useful little programs, has introduced another gem with their *CoCo Archiver*. This product is written in BASIC, which would seem to invite modifications, but its code is a bit obscure with lots of peeks and pokes. As such, it can be regarded as a "black box" program to be used, but not neccessarily understood. A Help and Information selection on the main menu advertises a saving of disk storage space of up to 50 percent. Considering the type of files you may be archiving, such a claim is possible. Be advised, however, that some kinds of files archive tighter than others. Machine language programs are quite dense and cannot be made much more efficient than they already are, while ASCII files, such as text processor or output data, compact well and BASIC programs fall somewhere in between. BASIC commands can be easily converted to tokens or one to three character symbols. But heavily commented code or programs that contain a lot of character strings are less receptive to compacting. As a test, I archived my entire word-processing disk, with a full 67 granules, into a single file of 42 granules — a savings of 25 granules or over 35 percent. The disk contained a mixed bag of files, mostly ASCII text files, but also

historical records are stored. One of the problems with software and data that you don't currently want is that it takes up a lot of room on your disks, which take up a lot of room in your file boxes, which take up a lot of room in your workspace. The purpose of an archiving utility is to "crunch" the files to take up less room on your disks. A good analogy is a trash compactor, which compresses

create the archive. Of course, the most important ability is the Retrieve facility, which allows you to de-arc a program or file when needed. You can send it to a disk "unfolded" and as good as new. View it on the screen or send it to computer memory to run BASIC or ML programs directly after de-arcing, without having to mess with an exit procedure.

Danosoft recommends using *CoCo Archiver* along with two or three of their other products; in particular *Big Disk* from their Disk Utilities package, and *Big RAMDisk* (both of which I've reviewed in past issues of THE RAINBOW). If you have 512K and want to use the options to add and delete files from existing archives, I strongly suggest using *Big RAMDisk*. Make the change in memory and transfer the rebuilt archive to the floppy. Twice I've had disk errors while deleting an element from an archive. The problem seems to be in the disk drive's slow reaction time. The CoCo is doing six things at once and the drive can't update the physical disk fast enough. The RAMDisk, on the other hand, updates at the computer's own speed, so I never got the file-specification errors I did with the mechanical drive. The *Big Disk* utility is helpful for extending your disk from 155K to 360K (an extra 90 granules) allowing you to cram more of any kind of files onto your disks. A disk formatted at 360K and filled with archived files can hold more than four times a 35-track disk filled with normal data. A second physical drive is also helpful. It speeds the arc and de-arc cycles.

This is the first product I'm aware of that Danosoft has sold with a shareware option. You can legally upload it onto a BBS or give a copy to a friend, but a donation to Danosoft is requested. The going price is listed below and, since it's quite functional without external documentation, I suggest sending Danosoft the full amount. It's well

Graphics Utility

One of the primary complaints I heard when the Color Computer 3 came out was that despite its beautiful graphics capabilities, there was no easy way to save a graphics screen to disk. One method of storing to disk required doing thousands of LPEEKs from low (graphics) memory and corresponding pokes to normal 64K memory, then a SAVEM. It was very slow, but usually effective. The other option was to write a BASIC program to draw the screen, save the program, then go out for a pizza while it re-created your masterpiece. Today, things are a little more simple. There are several artistic products that let you create and save screen paintings easily. I even have two from Tandy that run under OS-9. The basic problem still remains; dozens of graphics commands available, but no easy way to store and view your creations.

I'm beginning to believe that Bill Daniels of Danosoft reads the *Letters to THE RAINBOW* each month just to look for new problems to solve. If that's the case, maybe we should all chip in to renew his subscription.

For the uninitiated, Danosoft is a little software company in Canada that produces marvelous programs, at modest cost, to serve many of the CoCoist's needs. Danosoft specializes in common-sense utilities that help to maximize your enjoyment and usefulness of your CoCo. This time we look at Danosoft's solution to the high-resolution graphics problem.

Danosoft's *Graphics Utility* is not, strictly speaking, a utility at all. Anyone familiar with the Danosoft *Baby BASIC* product (reviewed here last year) would find this utility very similar. The *Graphics Utility* is another tutorial on the inner workings of the Color Computer and how to make it work harder for you. Some of the ideas expressed are a little sophisticated, but any user with some BASIC programming experience should find it easy to incorporate the neccessary elements into their own program.

The disk contains only one heavily remarked BASIC demonstration program. The printed documentation is a four page pamphlet that really contains only a few suggestions and a table of memory blocks. For the real documentation, first run the demo program to see what it does, then list it on the 40-column screen (I printed it) to see how it works. The seven-page listing tells all you need to write (or copy) the Hi-Res subroutines into the BASIC programs you write.

These subroutines allow you to store several Hi-Res screens at once in memory and flip between them. Instead of just one HSCREEN 1 or 3 at a time, you can flip between three in a 128K machine and more than 25 in a 512K machine. The HSCREEN 2 and 4 formats use more colors and, therefore, more memory, allowing up to 13 images in a 512K machine. Unfortunately, because of the machine's design, a 128K CoCo 3 still holds only one HSCREEN 2 or 4 picture at a time. There is also an option to use a 1-Meg memory expansion board to more than double the storage area. It is possible to store nearly 60 screens in a 1-Meg machine, giving the potential for serious animation.

The other purpose of the tutorial, of course, is to save and load HSCREEN Hi-Res pictures to disk. Each picture takes 16K to 32K of disk space depending on its resolution. The disk functions are much, much faster than re-drawing a picture every time you want to view it.

A bit of advice, if I may. The Danosoft *Graphics Utility* is not for the casual user who expects the product to do all the work. You should already have some background

CORRECTIONS

"Type Does Windows" (June 1990, Page 36): The `while` statement on the 11th line of the listing on Page 37 should have two minus signs after the opening parenthesis. The corrected line is

```
while(--argc > 0 && (*++argv)[0] == '-') {
```

"*Spell Master*" (Review, January 1991, Page 78): The address for Daniel Tuttle, the author of *Spell Master*, is incorrect. The correct address is 325 Hillstown Road, Manchester, CT 06040.

Lyra

Lyra, the ever popuplar music editor that lets you compose music using a mouse, is also available for the IBM PC. All the music you make with the CoCo version is compatible with the PC version. Only $37 for Lyra and the 100 page Lyra Companion.

CoCo MIDI Pro

CoCo MIDI Pro is a complete 16 track MIDI recording studio. Play music on your MIDI synthesizer and record it into your CoCo. Modify it with CMPro's powerful editing commands, and save it to disk or tape. Many professional musicians use the program and say that it is every bit as good as sequencers running on the IBM PC or Mac. Only $125 for the program and the required MIDI interface program pak.

Hot CoCo!

Hot CoCo! is a 50 minute audio tape that shows you how other musicians have put our products to good use. Check out the Rainbow October 1990 review that described this tape as "an excellent purchase, and I recommend it for all, whether or not they have a CoCo." Only $9.95.

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in writing your own BASIC programs. This isn't to say that the *Graphics Utility* is difficult, it's quite simple in fact. It can be broken down to about a half-dozen lines of code using all the functions. The most sophistication required is deciding where to place the subroutines in your program and how best to call them. The author has even thrown in some freebies. There's a short routine to protect your changes from being erased by the reset button and some advice on using the high-speed poke.

Danosoft's *Graphics Utility* should be considered by any serious BASIC graphics programmer. The knowledge gained and the product's usefulness are well worth its reasonable price.

(Danosoft, Box 124, Station A, Mississauga, ON L5A 2Z7, Canada; 416-897-0121; $8.95 U.S., $10.50 Cdn; plus $2.50 S/H; Ontario residents add 8% tax)

— Fred Toon

Utility	OS-9

File Recovery System

Like many CoCo users, I've had my share of corrupted Disk BASIC disks. Dealing with these disks is tedious, but not too difficult. Several articles in THE RAINBOW have dealt with file recovery for Disk BASIC. Unlike Disk BASIC, OS-9 is a very stable operating system in that it very rarely loses or corrupts files. Occasionally, though, we all seem to lose files, even under OS-9. I had a lot of problems when I first converted to a CoCo 3 running OS-9 Level II. It turned out that the problem was caused by a faulty slot-select switch in the Multi-Pak Interface. When it was removed, things went back to normal. What I'm leading to here is that although OS-9 files are rarely lost, they are very difficult to recover manually. The directory structure and file descriptors are more complex than with Disk BASIC, making the job of rebuilding lost or corrupted files quite involved.

To help with the recovery of lost or corrupted OS-9 files and directories, Burke & Burke has a new product called *File Recovery System* (FRS). Included in the FRS package are five programs that are used with `dcheck` to recover lost files on OS-9 disks. Let me briefly describe each of the FRS programs and then explain how they are used together to recover lost files. `ba` and `bd` are used to manipulate the disk's cluster allocation-bit map. This is the area of the disk that tells the operating system which clusters are free and which are in use. `ba` marks clusters as used and `bd` marks clusters as free. Either must be used with extreme caution since changing the allocation map can render files unreadable or useless. `bd` could even tell OS-9 that clusters are available when they shouldn't be, allowing OS-9 to overwrite them. `mv` is a utility that moves a directory entry from one directory to another. Unlike the operation of copying and deleting, `mv` moves only the directory entry if the move is on one disk. This allows you to put a file into another directory without rewriting the file and possibly overwriting lost clusters. `mv` is also useful for moving entries on an almost full disk. `zap` "loses" a file or directory. It is used to clear a directory entry without freeing the clusters occupied by the file. This is useful if a file becomes unreadable. Deleting the file frees the occupied clusters, but OS-9 then tries to reuse them. If the problem with the file is due to unreadable sectors, those sectors are marked "free" and are used again causing another file to be lost. `recover` is the main utility included with FRS. It is used to locate lost file descriptors and file data creating new directory entries.

To recover files using FRS, the file system must be intact. The `dcheck` utility included with OS-9 determines whether this is the case. The first step in the recovery process is to run `dcheck` on the problem disk. If the file system is not intact, run `zap` and `ba` to stabilize the directory structure using information provided by `dcheck`. The process is cyclic. Run `dcheck`, `zap` and `ba` until your directory structure is intact and stable. `zap` is used to remove directory entries that no longer correctly point to files. `ba` is used to "lock" unattached clusters. Once the directory system is stable, you can run `recover`, which uses the work files created by `dcheck` as input. According to the program instructions, it may be necessary to run `dcheck` followed by `recover` as many as three times to fully recover lost files and directories. The problems I created never required running these more than twice, but I really didn't have the ability to thoroughly mess up a disk. The procedures outlined in the instructions allowed me to fix all the problems I artificially created, though.

The manual accompanying *File Recovery System* is short. The explanations and directions are adequate, but could be more detailed. A detailed example or two would help. The most helpful addition might be for Burke & Burke to supply a "damaged" disk for experimentation. It would certainly have helped my review. I had some trouble damaging the file structure of a disk to have something to experiment with.

I have only one other comment. I don't know how successful FRS is at restoring lost executable files. I suppose if the file is stored on consecutive clusters it works, but I had no chance to try it. Since you should never work with your only copy of an executable file, this shouldn't be considered a shortcoming of FRS. Consider it a reminder, though. Don't use the only copy of a program you have.

Burke & Burke has a new product called *File Recovery System* (FRS). Included in the FRS package are five programs that are used with dcheck to recover lost files on OS-9 disks.

Burke & Burke has produced a package that you won't need very often, but when you need it, you'll need it bad. Be glad you have it on hand. Be sure to practice a little with it beforehand, though. You want to be prepared. Otherwise, it might take a while to recover what you lost.

(Burke & Burke, P.O. Box 733, Maple Valley, WA 98038; U.S. orders 800-237-2409; International & Technical 206-432-1814; $24.95 plus $3 S/H)

— Don McGarry

Utility	CoCo 1, 2 & 3

Brainbuster Testwriter

It's getting close to the big test and you have to create it. Do you break out the textbook, your notes, put on the coffee and start to cram? No. Grab your trusty CoCo, load Trading Post's *Brainbuster Testwriter* and the associated data disk. Then, since

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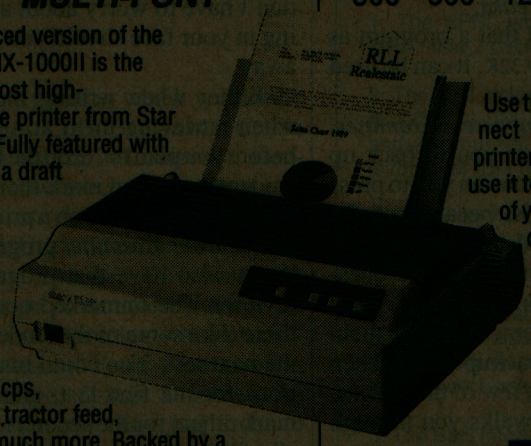

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you are the teacher, you must decide which of the several hundred questions stashed away are going to be used on the verm . . . er, students in your class.

"Heh, heh, heh," you chortle in your best Vincent Price impression as you select the most diabolical questions ever devised, "let them figure these out. Pour Hydrogen Sulfide in *my* car, will they?"

Even though *Brainbuster Testwriter* is designed primarily for teachers, anybody who wants to set up a bunch of questions can use it. For example, use it for varied learning areas from the Bible, through formal training where you work, to trivia questions about *Twin Peaks*.

It's amazing to read that a program as diverse as this uses only 32K. It can be used on a CoCo 1, 2 or 3.

As with their *Brainbuster Examiner*, Trading Post encourages you to back-up the original disk. They caution you to press Reset before doing this, because of the high-speed poke. They also warn you not to use regular quotation marks in the questions, but to use apostrophes instead. Heed these cautions. I read them, but forgot them after formatting the backup disk. Then strange things happened, few of them pleasant. Trading Post also walks you through the process of configuring your program disk for the number of drives being used and your printer's baud rate. Once configured, you don't have to fool with it each time you use the program.

The instructions are clear, but they're not short since there are many things you can do with this program. After a general discussion of how the program works, there is an excellent description of each command. The easiest way is to work your way through the commands and progress from basic to fancy.

The main menu presents you with the following choices, the purposes of which are generally obvious:

1. Enter Questions
2. Edit/View/Select
3. Print Test
4. Utilities
5. Load File
6. Save/Restart
7. Exit

A couple of these choices have their own submenus. Between the menus and the easy-to-read instructions, you'll be able to devise a test in relatively short order. However, remember that it takes longer to invent a test than to take one. Some have said it even takes more thought.

The Enter Questions option allows you to begin making up the questions right away. Decide among five possible multiple-guess answers or the lethal True/False. You can keep doing this until it's time to store the questions. And, even though you type away with blithe spirit disregarding where words begin and end, the program performs a "word-wrap" function so that the little darlings aren't more confused than usual.

Store the completed questions on the data disk. The program tells you how many questions you have fiendishly invented and how much memory is left, which is a nice feature. Of course, that refers to the programs's memory, not yours. At least you don't have to worry about a Save detonating in your face should you get too carried away.

Either when writing the questions or when retrieving them at a later date, just before you plan to "drop the bomb" on your students, you can mark them for use. The marked ones appear on a printout, or on the *Brainbuster Examiner* program on a screen if you also have that program (see other review). The unmarked questions just sit there (like some of the students), ready for the next test. You could mark some questions for the first test, unmark them and mark others for the second test. Then mark all of them for the final. (Heh, heh.)

Of course you can view or edit the questions and answers at just about any time. Get to that question either by scrolling or jumping and change the question or the possible answers. The paranoid mind might even want to change the order of the answers to defeat the intelligence information passed on from last year's class. You would also have to change the mark that indicates the right answer. That mark doesn't show on the printed test, so don't worry. However, it does allow you to print the answer sheet for easy grading. You can remove the marks individually or all at once.

The Print Test menu entry has its own submenu, allowing you to act even more diabolical. It puts the questions in at random, which might help puzzle the "system" students who try to read your mind and plug in A,B,C,D,E in the order they think you have set them. It offers you all sorts of capabilities, including printing a heading and/or a cover page. You can even chain-print questions from more than one file on the data disk. You can also develop an entirely new test by transferring marked questions from different files to a totally new file.

Again, it's hard to imagine all these options and capabilities stuffed into 32K. This is an extremely versatile program. I highly recommend it to anybody who occasionally needs to write examinations, whether for serious or frivolous reasons.

(The Trading Post, P.O. Box 3453, Carbondale, IL 62902-3453; $39.95, plus $3 S/H)

— John M. Hebert

Utility OS-9

Superbook

When I started programming on the CoCo, the manual it came with was adequate for teaching the basics. I soon found, though, that the manuals didn't go far enough in some areas for things I wanted to do. After getting recommendations from Radio Shack, and other users, I started a CoCo library. Over the years the library has grown to include about a dozen books, approximately 100 magazines and some odds and ends filed away.

When I wanted to know something about the CoCo I moved to the library and searched through my collection. Sometimes, I knew exactly where to find the information I wanted. Other times, I had to search through a couple of books and/or several magazines. *Superbook* would have come in handy at times like these.

Superbook contains a wealth of information about programming the CoCo 1, 2 and 3. While most of the information can be found in other places, it is scattered between different books and magazine articles, some of which are not easily found.

The information is grouped by subjects, such as printer control, hardware registers, MMU registers and many other subjects. The information is presented well and is very readable. There are some usage examples as well as some hints and tips scattered around. The language used and the contents of *Superbook* are aimed at the intermediate to advanced BASIC programmer. A basic knowledge of assembly language programming and how the CoCo works is necessary to fully use the book, but is not necessary to use the CoCo.

Superbook is not designed as a tutorial about the inner workings of the CoCo or assembly language, but as a reference for those who would like to use the advanced features of the CoCo 3. It makes a nice addition to my library. It has become one of the first books I look in for information.

(Supersoft, Inc., 363 Oakwood Avenue, Jackson, MI 49203; 517-787-3610; $14.95 plus $2.50 S/H)

— Chris Hyde

Received and Certified

The following products have recently been received by THE RAINBOW, examined by our magazine staff and issued the Rainbow Seal of Certification, your assurance that we have seen the product and have ascertained that it is what it purports to be.

KJV on Disk #17, the books of Ezra, Nehemiah and Esther from the King James version of the Bible in ASCII files for the CoCo 1, 2 and 3. A word processor or text editor is recommended for viewing the files. Requires at least 32K and one disk drive. *BDS Software, P.O. Box 485, Glenview, IL 60025-0485; $3.*

KJV on Disk #18, the book of Job. *BDS Software, P.O. Box 485, Glenview, IL 60025-0485; $3.*

DSDISK#2, contains two programs by David Sham. MAC4.BAS is a MAC to HSCREEN 2 transfer (size = 1/4). Requires 512K and a RAM disk. MAC4S.128 is the 128K version of MAC4.BAS, which requires a CoCo 3 and one disk drive. Four MAC and three CM3 picture files are included on the disk for testing the programs. *David Sham, 1155 E. 33rd Avenue, Vancouver, BC V5V 3B4 Canada; $17 U.S. plus $3 S/H; personal checks not accepted.*

CoCo-Cassette #100, a variety of programs, presented monthly, for the CoCo 1, 2 and 3. This month includes: *Zot Mind Game*, a strategy board game played against the Computer; *Super Text Editor*, an easy-to-use text editor; *Super Text Formatter*, the companion program to the text editor; *Turtle Search*, a game in which you locate the Ninja Turtles, CoCo 3; *Coast to Coast*, start driving a big rig in Louisville, Kentucky, to see how much money you can make; *Easy Basic 3*, IBM disk commands for the CoCo 3. Use wild cards, auto repeat, and pause key; *Dragon Adventure*, 32K adventure game to protect the wizard; *Write Out Utility*, a programming word-processor utility; *Trythis*, a Tetris-type game in machine language; *Donut Dilemma*, an arcade game to restore law and order to Antonio's Donut factory; *T&D Subscription Software, 2490 Miles Standish Drive, Holland, MI 49424, 616-399-9648; $8.*

First Prize, make awards, certificates, licenses, and diplomas with a 64K CoCo 2 or a CoCo 3. Use the extensive collection of templates and add borders, dates, and signature lines to make your personal documents. Various fonts and text sizes are available for placement in the main text areas. Package includes a 32-page user manual, a 64-page template directory, one program disk, and nine template disks. Requires a joystick or mouse, disk drive and compatible printer. Specify your printer when ordering. *Zebra Systems, Inc., 121 S. Burrowes Street, State College, PA 16801, 814-237-2652; $49.95 introductory price, plus $3 S/H; UPS or COD add $3.*

The *Seal of Certification* is open to all manufacturers of products for the Tandy Color Computer, regardless of whether they advertise in THE RAINBOW.

By awarding a *Seal*, the magazine certifies the program does *exist* — that we have examined it and have a sample copy — but this *does not* constitute any guarantee of satisfaction. As soon as possible, these hardware or software items will be forwarded to THE RAINBOW reviewers for evaluation.

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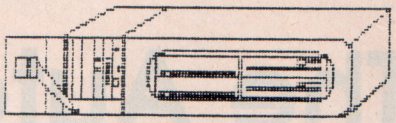

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2: The CAT holds all major components. IE: COCO 3, SPBI, 200 watt power supply, and up to four half height drives. Also there is room for IBM type key board interface.

3: Power for the COCO 3, SPBI and up to 4 drives. IE: 2 hard drives and 2 floppy drives.

4: Access to 5 packs directly from the front panel which also hinged for ease of access. The front panel also has a Thumb wheel switch w/led indicator.

5: The B&B Interface and the disk controller are mounted in the CAT, behind the SPBI.

6: All outputs are on the rear panel. Key board extension cable is included. Power indicator and reset button are also on this extended cable (a $40.00 value included).

7: The CAT was tested with 2 terminals online, 2 hard drives, 2 floppys, speech and sound pack, a printer and 3 windows all being accessed at the same time with no apparent IRQ problems.

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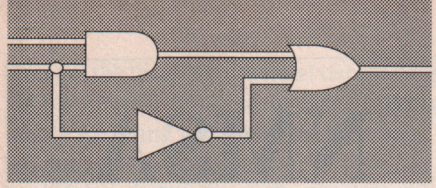

The Auto Formatter

by Greg Law
Technical Editor

With the relative low cost and availability of disks these days, most people prefer to purchase disks in bulk, usually 100 or more at a time. The big problem with bulk disks is trying to get all of them formatted so they can be used. I don't think anyone particularly enjoys having to run `format` umpteen dozen times. I sure don't. I usually start getting dizzy after half a dozen times. *Auto Formatter* is an intriguing program written by Carl Johnson that formats a specified number of disks without you having to execute `format` repeatedly. This feature is particularly handy when formatting those bulk disks you ordered.

The program is written in BASIC09 and is fairly straightforward, without any tricks. Simply tell *Auto Formatter* how many disks to format and insert each disk when prompted. When run, the program clears the screen, loads `format`, prints a short copyright notice and prompts you to press a key. All of the variables used by the program are declared, and the screen is cleared again. The program then prompts you for the volume label to be used on each disk, the number of disks to be formatted, the starting disk number, the drive number, the number of cylinders (or tracks) to format, and the number of sides (or heads). Even though *Auto Formatter* prompts for 35 or 40 tracks, you can enter any number of tracks and it will work with 80-track drives.

In addition to being OS-9 Online SIGop, Greg Law enjoys programming on all types of computers and has worked on systems ranging from the CoCo to the Burroughs B6700 super mainframe. He lives in Louisville, Kentucky.

One of the nice features is that the program numbers each disk for easy identification. When the program asks for the number of disks to be formatted, enter the number of the last disk you want to format. For example, if the starting disk number is 1 and the number of disks is 25, it formats 25 disks numbered 1 through 25. On the other hand, if the starting disk is 26 and the number of disks is 50, it formats 25 disks numbered 26 through 50. This disk number is also appended to the volume label so you can format bulk disks in easy-to-handle numbers, such as 10 or 20 at a time, with each disk identified by number.

```
name        DiskName
fname       VolumeLabel
d           DriveName
cy          Tracks
s           Sides
start       FirstDisk
a           LastDisk
b           CurrentDisk
c           Key
l           Key
t           Counter
r           Ready
```

Figure 1: Suggested Variable Names

The actual process of formatting a disk is performed at Offset $0383. Here the command line is built by concatenating the various strings and passing the result to the shell, which is an easy task thanks to the modularity of OS-9. Note that the output from `format` is redirected to `/nil`, which simply eats all data written to it. If you don't have `nildrv` and `nil` in your boot file or you want to see the output from `format`, remove +">/nil" from the line at Offset $0383. According to the author, redirecting the output to `/nil` greatly speeds up the formatting process. You may want to try it both ways and use the method you prefer. After each disk is formatted, you are asked if you are ready to format the next disk. At this point, insert the next disk to be formatted and press Y to continue.

Although *Auto Formatter* works very well, it is somewhat difficult to follow the source code due to the use of cryptic single-character variable names. I find it much easier to use long variable names that describe what the variable is used for. Keep in mind that the first eight characters in a variable name are significant in BASIC09. BASIC09 looks at the first eight characters of a variable name to determine which variable it is referencing. Even so, you can use much longer variable names provided the first eight characters are different for each variable. For example, `VolumeLabel` is the same variable as `VolumeLabels` since the first eight characters (`VolumeLa`) are the same.

Another nice advantage with BASIC09 is that it remembers how the variable name was typed the first time. For example, if you declare the variable as `DIM VariableName:STRING[32]`, you can type `variablename` throughout the rest of the listing and BASIC09 automatically converts it to `VariableName`. With this in mind, I've created a list of variable-name changes you may want to make to the listing (Figure 1). You may notice I have also suggested changing both variables `l` and `c` to `Key`. This is because they are both used for the same purpose in different parts of the program. Another change you may want to make is to use `PRINT CHR$(12);` or `RUN gfx2("Clear")` instead of `SHELL "display 0c"` at offsets $0006, $0176, $02DB and $03D2. The use of `PRINT` is a lot faster and calling `gfx2` is much more descriptive. ❑

The Listing: auto.b09

```
PROCEDURE auto
 0000       ON ERROR GOTO 1000
 0006       SHELL "display 0c"
 0014       SHELL "load format"
 0023       PRINT " Auto Disk Formatter "
 003C       PRINT "     (c) 1989          "
 0056       PRINT "   by: Carl Johnson      "
 0073       PRINT "   6030 N. 43 Road   "
 008C       PRINT "   Manton, MI 49663"
 00A3       PRINT "    (616)824-6655"
 00B8       PRINT  \ PRINT  \ PRINT
 00BE       PRINT "Press a Key  ";
 00D0       DIM l:STRING[1]
 00DC       SHELL "tmode -echo"
 00EB       GET #0,l
 00F4       SHELL "tmode echo"
 0102       DIM name:STRING[30]
 010E       DIM start:INTEGER
 0115       DIM d:STRING[10]
 0121       DIM cy:STRING[4]
 012D       DIM s:STRING[1]
 0139       DIM a,b:INTEGER
 0144       DIM c:STRING[1]
 0150       DIM t:INTEGER
 0157       DIM r:STRING[1]
 0163       DIM fname:STRING[30]
 016F       DIM ernum:INTEGER
 0176       SHELL "display 0c"
 0184       PRINT "Name of disks ? :" \ INPUT name
 019E       PRINT "How many disks are you going to format? " \ INPUT a
 01CF 10    PRINT "Start with what number? (1-"; a; ")" \ INPUT start
 01FE       IF start<1 OR start>a THEN GOTO 10
 0215       ENDIF
 0217       PRINT "Which drive are you formatting  ( 0, 1 ) :" \ INPUT d
 024A       PRINT "How many cylinders ? ( 35 or 40 ) :" \ INPUT cy
 0276       PRINT "How many sides ? ( 1 or 2 ) :" \ INPUT s
 029C       d="/D"+d
 02A9       r="r"
 02B1       cy=CHR$(39)+cy+CHR$(39)
 02C1       FOR t=start TO a
 02D3         b=t
 02DB         SHELL "display 0c"
 02E9         PRINT "    Formatting Disk Number "; b \ PRINT "          As "
               ; name+" #"+STR$(t) \ PRINT "           "; MID$(cy,2
               ,2); " Tracks" \ PRINT "          "; s; " Sides" \
              PRINT
 0369         fname=CHR$(34)+name+" #"+STR$(t)+CHR$(34)
 0383         SHELL "format "+d+" "+r+" "+s+" "+fname+" "+cy+" "+">/nil"
 03BE         fname=""
 03C5         IF b=a THEN
 03D2           SHELL "display 0c"
 03E0           PRINT  \ PRINT
 03E4           PRINT "We have formatted all "; b; " disks.  Thank you for letting me help!"
 042C           PRINT  \ PRINT  \ PRINT
 0432           GOTO 100
 0436         ENDIF
 0438         PRINT  \ PRINT  \ PRINT
 043E 75      PRINT "Continue           (Y/N)?";
 0460         SHELL "tmode -echo"
 046F         LOOP
 0471           GET #0,c
 047A           IF c="n" OR c="N" THEN GOTO 100
 0492           ELSE
 0496             IF c="y" OR c="Y" THEN GOTO 80
 04AE             ENDIF
 04B0           ENDIF
 04B2         ENDLOOP
 04B6 80      SHELL "tmode echo" \NEXT t
 04D2 100   SHELL "unlink format"
 04E6       SHELL "tmode echo"
 04F4       END
 04F6 1000  SHELL "tmode echo" \ernum=ERR
 050D       t=t-1
 0518       PRINT "You have Error #"; STR$(ernum); " in the Auto-Formatter"
 054A       GOTO 75
```

Continued from Page 6

made to work with the CoCo 1 or 2. We understand the TC-9 Tomcat from Frank Hogg Laboratories and the MM/1 from IMS will support the CM-8. And if you are willing to build a new cable, it works (after a fashion) with CGA video on MS-DOS computers.

A Supporting Role

Editor:

I have subscribed to THE RAINBOW for three years and have watched its pages and programs dwindle during this period. The flood of advertising and invasion of the IBM-compatible machines have often left me wondering if I purchased the wrong computer. Lonnie Falk's editorial in the December issue hit the nail on the head. If we are to be a CoCo Community, we must continue to subscribe to THE RAINBOW and support its advertisers. I will venture into OS-9 very soon because of the ongoing addition of OS-9 programs in the magazine. I wish THE RAINBOW and all its advertisers continued success in the years to come so *I* can continue to enjoy my CoCo. Also, I have a program entitled *Battle Stations* written by Scott Smith and Eric White and originally distributed by Tom Mix Software. If anyone out there has a patch or a fix to make the program run in color on the CoCo 3, I would really appreciate hearing from you.

Mike Erickson
1239 Manville Road
Woonsocket, RI 02895

A Timely Situation

Editor:

I am looking for a genealogy program that works on the CoCo 2 as well as the CoCo 3. I would greatly appreciate any help on this matter.

I am also looking for a clock for the CoCo 3 that works under Disk BASIC. I found one called *The Insider* in the November 1987 issue of THE RAINBOW. I would also appreciate anyone having this clock hardware as well as the Disk BASIC and OS-9 drivers for it to contact me. Also contact me if you know the address of The United Computer Federation in Burbank, California.

Michael Holtry
695 Park Avenue, #216
Idaho Falls, ID 83402

Check the September and October 1987 issues for "Right Back Where We Started From" by Brian LeBlanc. The programs for this two-part article print information forms and store/retrieve family history information on disk.

Getting Online

Editor:

I would like some information on the kind of modems available for the CoCo 2. I would also like to know where I can get *MikeyTerm*. I heard through the grapevine that someone is marketing a Multi-Pak Interface device similar to the one Tandy discontinued. I would like an address for a place of purchase and whether or not it is compatible with my computer. The reason I ask about a modem is because I do not want to give up the interface port for my disk drive controller. Is there a modem that can be connected to my computer through the printer port?

Anthony Kiper
Grayson, Kentucky

Several RAINBOW advertisers sell Hayes-compatible modems that work with the CoCo 1, 2 or 3 through either the built-in serial port or an RS-232 pack. You can obtain MikeyTerm *by sending $10, a blank disk and a reuseable disk mailer to Mike Ward, 1807 Cortez, Coral Gables, FL 33134.*

The Slot-Pak III, a three-slot, Multi-Pak Interface work-alike, is available from Howard Medical.

Building Character(s)

Editor:

I have recently started working with BASIC09 and have run into a problem. How do you enter a program using brackets ([ ])? My CoCo does not produce these characters except in BASIC.

John LaRue
P.O. Box 2771
Lawton, OK 73507

As explained in the OS-9 manual, many of the special characters, such as braces and brackets, are generated with control-key combinations. Commonly needed characters are generated as follows:

CTRL-1	|	*vertical bar*
CTRL-3	~	*tilde*
CTRL-7	^	*caret*
CTRL-8	[	*open bracket*
CTRL-9	]	*close bracket*
CTRL-<	{	*open brace*
CTRL->	}	*close brace*
CTRL-/	\	*backslash*

World Perspectives

Editor:

I have a small problem. I own a Tandy Color Computer 3 and use OS-9 to operate my system. I upgraded it to 512K. I need maps of the world — maps of all regions and all continents. I suppose the only type of format I can see is either `.IMG` or `.GIF`. I am up against the wall on this one and hope you can help me find suitable material to accomplish this.

Robert Pierce
227 Deeds Avenue
Dayton, OH 45404

Offhand, we don't know of anyone who has a set of continental maps. Perhaps another reader can help. Also, check the Delphi databases. Since you can read `.GIF` *files, you might check the SIGs for other machines, too. Another option is to digitize the maps yourself. Get permission from the publisher first, though.*

In Search of Chess

Editor:

I have recently entered the CoCo 3 world and enjoy it. I have only one problem with this new world — finding a reasonably decent disk-based chess program. I say "reasonably" since most of the serious chess programs are written for MS-DOS computers. It seems possible to create something fairly challenging for the CoCo 3 user. I've tried *Cyrus* on ROM Pak from Radio Shack, but it doesn't appear to be compatible with the CoCo 3. The game displays the introductory title screen with a big error message across the left-center portion of the screen. The Radio Shack store manager said the program was probably designed to work only with older CoCos. The package doesn't have any information about this problem. I've tried one other program on disk, but it was a very small program and unable to play with intelligence, and I'm not a very good player. Maybe the creators of *Cyrus* have a disk-based version of their game. I would appreciate any help you could give me on this matter.

James Gunter
513 W. Mississippi, #32
Ruston, LA 71270

Speed It Up

Editor:

I understand there is a poke that doubles the clock speed of the CoCo 3. If so, I would appreciate knowing it. Also what, if any, ill effects will there be on my 68B09E (such as frying it). I know on 80xx/x-based systems you can cheat with the microprocessors, for example taking a 16-MHz 386 chip and raising the clock speed to 25 MHz. When running a chip at speeds it was not designed for, though, you can sometimes fry the microprocessor. I would really appreciate your help in this matter.

Rob Walker
544 129th Avenue, S.E.
Bellevue, WA 98005

The high-speed poke for the CoCo 3 is `POKE 65497,0`. *To return to normal speed, enter* `POKE 65496,0`. *The 68B09E is designed for operation at up to 2 MHz (that's what the B in the chip name tells you), so you needn't worry about frying chips by running the CoCo 3 at double-speed (1.78 MHz).*

The only drawback to using double-speed is that you must switch back to normal speed before performing disk or tape I/O. Saving a file while at high speed results in unreliable operation — the file won't be saved properly. Printer output is also affected. If you stay at high speed while printing, you must set the CoCo's baud to half the value the printer expects.

Building Her Library

Editor:

I am interested in finding some programs to use on my computer. I have a CoCo 3 (128K), DMP-105, FD-502 single disk drive, and color television. Currently, I have a few simple games and *DeskMate*. I am interested in a graphics program to produce banners, cards and signs. I would also be interested in any business software, or educational software for preschool age as well as information on challenging computer games.

I understand it would be advantageous to have a monitor, but perhaps there are programs that run with a television instead. Please send information on both types of programs as I'm sure to add a monitor to my computer collection in the future.

I have just been introduced to your magazine. Could you refer to any back issues that might help me?

Judy Cottrell
Box 976
Sechelt, BC V0N 3A0
Canada

Back issues of THE RAINBOW are a great source of software for the CoCo. See Page 80 of this issue for more information. In general, September issues deal with educational interests and March and April issues deal more with business aspects. Don't overlook the many advertisers on our pages, either. Many readers have spoken highly of Zebra Systems' Color Graphics Designer Plus *software for graphics needs.*

THE RAINBOW welcomes letters to the editor. Mail should be addressed to: Letters to Rainbow, The Falsoft Building, P.O. Box 385, Prospect, KY 40059. Letters should include the writer's full name and address. Letters may be edited for purposes of clarity or to conserve space.

Letters to the editor may also be sent to us through our Delphi CoCo SIG. From the CoCo SIG> prompt, type `RAI` to take you into the Rainbow Magazine Services area of the SIG. At the RAINBOW> prompt, type `LET` to reach the LETTERS> prompt and then select Letters for Publication. Be sure to include your complete name and address.

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Please note: The tapes and disks offered by The Rainbow Bookshelf are not stand-alone products. That is, they are intended to be an adjunct and complement to the books. Even if you buy the tape or disk, you will still need the appropriate book for loading and operating instructions. OS-9 is a registered trademark of the Microwave Systems Corporation.

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Come and walk the aisles — set your own pace between visiting the exhibits and attending the many invaluable, free seminars. Take part in the seminars offered, ranging in topics from BASIC to the sophisticated OS-9 operating system.

Stop by the RAINBOW booth and meet the faces behind THE RAINBOW. As well, those who are written about throughout its pages will be there to meet you and answer your questions. While you're at the RAINBOW booth, you can also take advantage of the reduced prices on the entire RAINBOW bookshelf. In addition, prices on all back issues will be reduced, giving you a chance to fill those holes in your library. You'll also meet many other people who share your interest in the Color Computer. RAINBOWfest is a person-to-person event, not to mention a tremendous learning experience in a fun and relaxed atmosphere.

While you're walking through the exhibit hall, keep your eyes open for CoCo Cat. Children and adults alike always enjoy the furry feline. And our mascot is no dummy — always looking for great deals, perhaps CoCo Cat has a hot tip for you.

RAINBOWfest is the place where commercial programmers show their newest programs and hardware for the first time. Plus, they will be listening to your comments and offering "special show prices." RAINBOWfest Chicago, is *the* place to get information on the capabilities of the CoCo, and find a terrific selection of the latest CoCo products. In exhibit after exhibit, there will be demonstrations, opportunities to try software and hardware, and special RAINBOWfest prices.

If you missed the fun at our last RAINBOWfest, why don't you make plans to join us in Chicago? For those members of the family who don't share your affinity toward the CoCo (for reasons we will never understand), there are many other attractions in the Chicago area.

Once again we are pleased to be holding RAINBOWfest at The Hyatt Regency-Woodfield, Schaumburg, Illinois. The show opens Friday evening with a session from 7:00 p.m. to 10:00 p.m. It's a daytime show Saturday - The CoCo Community Breakfast (separate ticket required) is at 8:00 a.m. sharp, and the exhibit hall opens promptly at 10:00 a.m. and runs through 5:00 p.m. On Sunday, the exhibit hall opens at 11:00 a.m., and the show closes at 3:00 p.m.

Tickets for RAINBOWfest may be obtained directly from THE RAINBOW. We'll also send you a reservation form so you can get a reduced room rate at the Hyatt Regency.

The POSH way to go. You can have your travel arrangements and hotel reservations handled through RAINBOW-affiliated Posh Travel Assistance, Inc., of Louisville. For the POSH treatment many of our exhibitors enjoy, call POSH at (502) 893-3311. All POSH services are available at no charge to RAINBOWfest attendees.

If your ticket order is one of the first five orders received from your state, you will receive a **Free RAINBOWfest T-Shirt!**

Show Information

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Dates *- April 26-28, 1991*
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Advance ticket deadline: April 12, 1991. Orders received less than two weeks prior to show opening will be held for you at the door. Tickets will also be available at the door at a slightly higher price. Tickets will be mailed six weeks prior to the show. Children 4 and under, free; over 4, full price.

Make checks payable to: RAINBOWfest, The Falsoft Building, 9509 U.S. Highway 42, P.O. Box 385, Prospect, KY 40059. To make reservations by phone, in Kentucky call (502) 228-4492, or outside Kentucky call (800) 847-0309.

Graphics Experiments

by Keiran Kenny

Graphics programming on the CoCo 3 HSCREEN 4 has the advantage of giving you the highest resolution available, but this is not without its pitfalls. If you are accustomed to programming on the HSCREEN 2 or PMODE screens, you will find that when you switch to HSCREEN 4, the results are often not what you expected.

Try HCIRCLE(160,96),95 on HSCREEN 2. The circle almost touches the top and bottom of the graphics screen. Now try HCIRCLE(320,96),190 on HSCREEN4. To get a circle that seems to encompass the same area of the screen as the HSCREEN2 example, you must double the radius.

By way of further illustration, try the handbook example

```
HCIRCLE(160,96),40:HDRAW"BM160,9
6NE4ONE28NR4ONF28ND4ONG28NL4ONH2
8"
```

on HSCREEN 2. Now try it on HSCREEN 4. The E option does not produce a line of the expected length at an angle of 45 degrees.

To get this equivalent on HSCREEN 4, you need a circle like that in Line 220 of the listing. But getting the radials nicely ranged around the circle requires special measures. Instead of using the E option, use the NM option with variables as shown in lines 310 and 320. The multiplier is .7 and is roughly the sin/cos value of 45 degrees.

In this case, the syntax for variable values is as shown in Line 230 (for example, NM+=X;,-=Y;). Note the indispensable semicolons. Also note the nominal length of the vertical in Line 210 is half the length of the horizontal line (confusing, isn't it).

The routine in lines 260-420 enables you to set lines at angles from 0-90 degrees using the HDRAW command. Stippled lines indicate the base and height of a triangle, as prescribed by the angle you choose, as well as their values (lines 390 and 400). The value displayed on the vertical axis is a pixel count and does not indicate the actual length relative to the base line. (I said it can be confusing!) If you want actual dimensions, change the INT(Y) in Line 400 to INT(Y+Y*Y2) and try an angle of 45 degrees to check.

You may find the input subroutine in lines 40-170 useful in your own programs. As in Line 270, set the horizontal coordinate P, the vertical C and perform a GOSUB40. If necessary, use the left arrow to backspace and correct your input before pressing ENTER. Strings are returned as VP$ and values as V.

The Listing: HSCR4EXP

```
0 'GRAPHICS EXPERIMENTS
1 'WRITTEN BY KEIRAN KENNY
2 'COPYRIGHT (C) MARCH 1991
3 'BY FALSOFT, INC.
4 'RAINBOW MAGAZINE
10 ONBRKGOTO430
20 RGB
30 GOTO180
40 PB=P:VP$=""
50 KY$=INKEY$:IFKY$=""THEN50
60 IFKY$=CHR$(13)THEN170
70 IFKY$=CHR$(8)THEN80ELSE130
80 P=P-1:IFP<PB THENP=PB:GOTO50
90 DR=HPOINT(P*8,C*8+1)
100 HCOLORDR:HPRINT(P,C),RIGHT$(
VP$,1)
110 VP$=LEFT$(VP$,LEN(VP$)-1)
120 GOTO50
130 IFP>78THEN50ELSEHCOLOR1:HPRI
NT(P,C),KY$
140 VP$=VP$+KY$
150 P=P+1
160 GOTO50
170 V=VAL(VP$):RETURN
180 PALETTE0,0
190 HSCREEN4
200 X=80*.7
210 Y=40*.7
220 HCIRCLE(320,96),80
230 HDRAW"BM320,96NU40NM+=X;,-=Y
;NR80NM+=X;,+=Y;ND40NM-=X;,+=Y;N
L80NM-=X;,-=Y;"
240 HPRINT(33,23),"PRESS ANY KEY
"
250 EXEC44539:K$=INKEY$:HCLS
260 HPRINT(0,0),"ENTER AN ANGLE
(0 - 88 DEGREES):"
270 P=33:C=0:GOSUB40
280 IFV<00RV>88THENHCOLOR0:HLINE
(264,0)-(288,7),PSET,BF:HCOLOR1:
GOTO260
290 X2=COS(V/57.29577951)
300 Y2=SIN(V/57.29577951)
310 X=300*X2
320 Y=150*Y2
330 HPRINT(0,2),"X=300*"+RIGHT$(
STR$(X2),LEN(STR$(X2))-1)+" = CO
S("+VP$+")"
340 HPRINT(0,4),"Y=176*"+RIGHT$(
STR$(Y2),LEN(STR$(Y2))-1)+" = SI
N("+VP$+")"
350 HPRINT(0,6),"HDRAW"+CHR$(34)
+"BM320,176M+=X;,-=Y;"+CHR$(34)
360 HDRAW"BM320,176M+=X;,-=Y;"
370 FORZ=320TO320+X STEP6:HSET(Z
,176):NEXT
380 FORW=176TO176-Y STEP-3:HSET(
320+X,W):NEXT
390 HPRINT(39+INT(X/2/8),23),INT
(X)
400 HPRINT(40+INT(X/8),21-INT(Y/
2/8)),INT(Y)
410 HPRINT(0,23),"PRESS ANY KEY.
"
420 EXEC44539:K$=INKEY$:HCLS:GOT
O260
430 RGB:CLS:END
```

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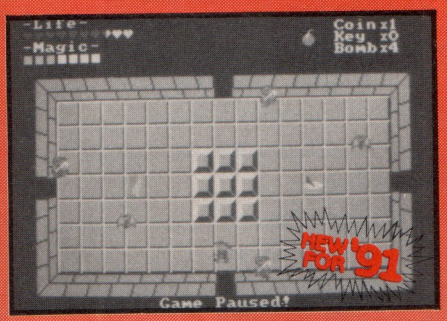

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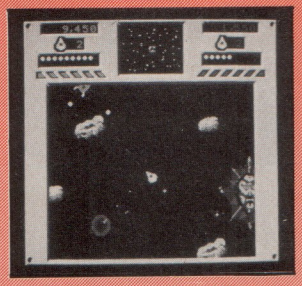

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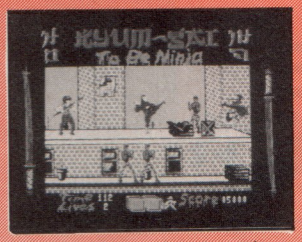

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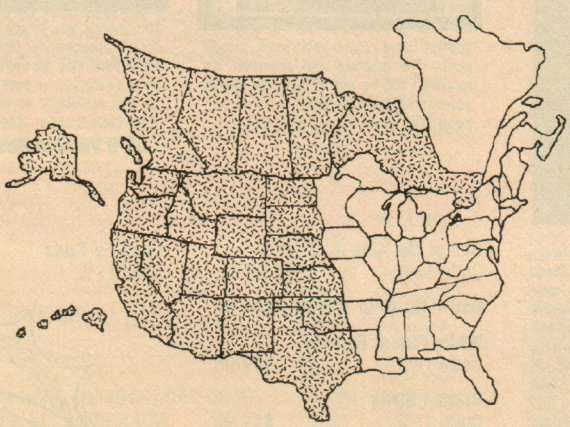

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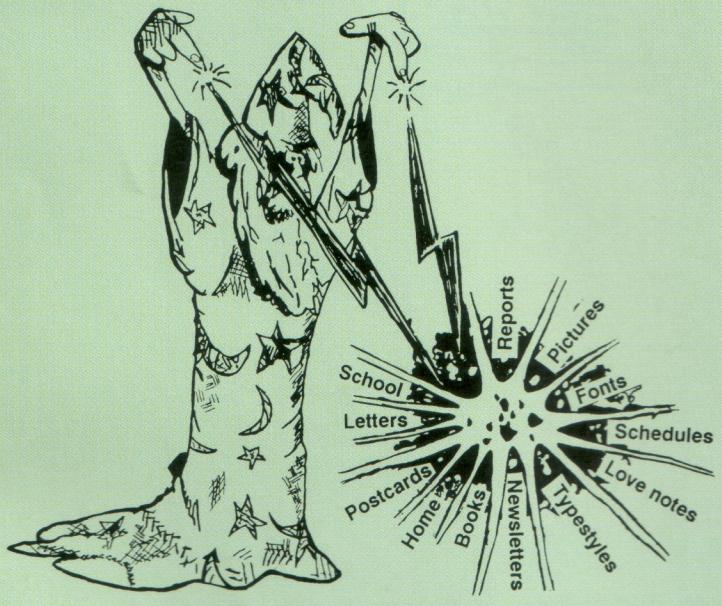

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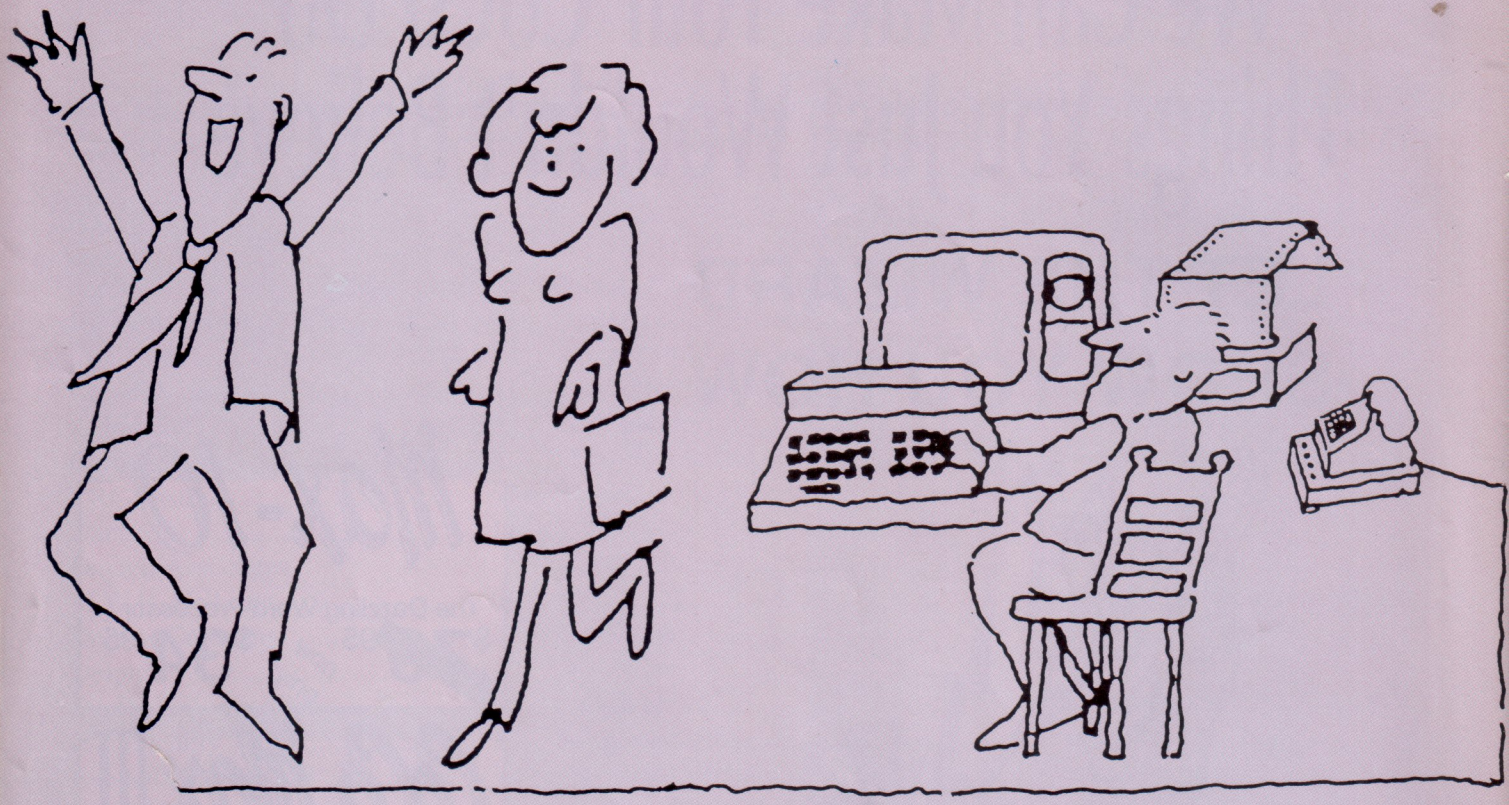

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